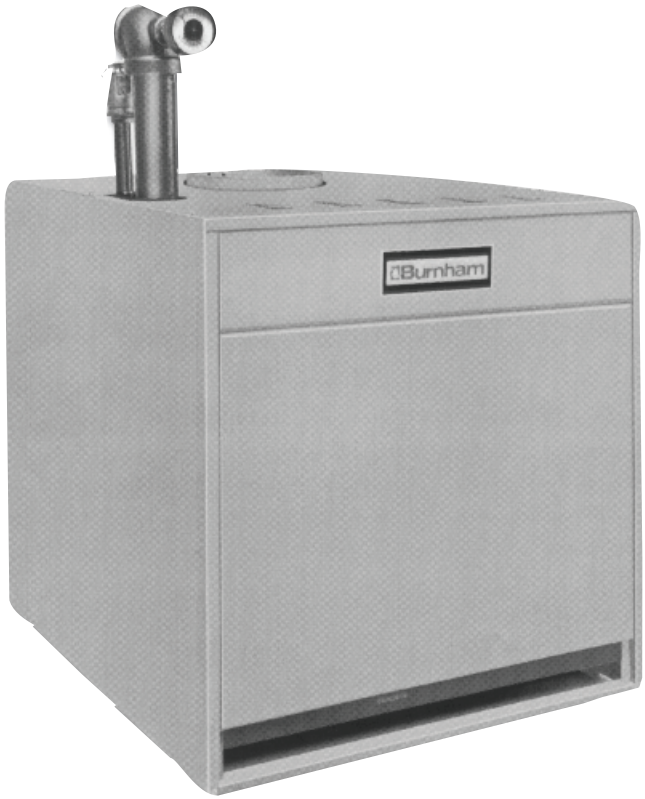
INSTALLATION, OPERATING AND SERVICE INSTRUCTIONS FOR

SERIES 8B

GAS - FIRED BOILER



For service or repairs to boiler, call your heating contractor. When seeking information on boiler, provide Boiler Model Number and Serial Number as shown on Rating Label.

Boiler Model Number	Boiler Serial Number	Installation Date
_8_ _ _ _ _ - _ _ _ _	6_ _ _ _ _ _ _	
Heating Contractor		Phone Number
Address		

BURNHAM COMMERCIAL
AMERICA'S BOILER COMPANY

8141602R14-1/04

Price - $5.00

IMPORTANT INFORMATION - PLEASE READ THIS PAGE CAREFULLY

NOTE: The equipment shall be installed in accordance with those installation regulations enforced in the area where the installation is to be made. These regulations shall be carefully followed in all cases. Authorities having jurisdiction shall be consulted before installations are made.

All wiring on boilers installed in the USA shall be made in accordance with the National Electrical Code and/or local regulations.

All wiring on boilers installed in Canada shall be made in accordance with the Canadian Electrical Code and/or local regulations.

This Series 8B Boiler has been approved by the Massachusetts Board of Plumbers and Gas Fitters:
Approval No. G1-0202-11A.
The Commonwealth of Massachusetts requires this product to be installed by a licensed Plumber or Gas Fitter.

The following terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning product life.

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death, serious injury or substantial property damage.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in moderate or minor injury or property damage.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death, serious injury or substantial property damage.

NOTICE

Indicates special instructions on installation, operation, or maintenance which are important but not related to personal injury hazards.

DANGER

DO NOT store or use gasoline or other flammable vapors or liquids in the vicinity of this or any other appliance.
If you smell gas vapors, DO NOT try to operate any appliance - DO NOT touch any electrical switch or use any phone in the building. Immediately, call the gas supplier from a remotely located phone. Follow the gas supplier's instructions or if the supplier is unavailable, contact the fire department.

DO NOT install this boiler on combustible flooring, carpet, concrete over combustible flooring or wood, nor on concrete over any heat affected material such as plastic piping or wiring without a properly installed combustible floor shield.

WARNING

This boiler requires regular maintenance and service to operate safely. Follow the instructions contained in this manual.

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Read and understand the entire manual before attempting installation, start-up operation, or service. Installation and service must be performed only by a knowledgeable, experienced, and skilled installer or service agency.

This boiler must be properly vented.

This boiler needs fresh air for safe operation and must be installed so there are provisions for adequate combustion and ventilation air.

The interior of the venting system must be inspected and cleaned before the start of the heating season and should be inspected periodically throughout the heating season for any obstructions. A clean and unobstructed vent system is necessary to allow noxious fumes that could cause injury or loss of life to vent safely and will contribute toward maintaining the boiler's efficiency.

Installation is not complete unless a pressure relief valve is installed into the tapping located on the top of boiler - See the Water Piping and Trim Section of this manual for details.

This boiler is supplied with safety devices which may cause the boiler to shut down and not re-start without service. If damage due to frozen pipes is a possibility, the heating system should not be left unattended in cold weather; or appropriate safeguards and alarms should be installed on the heating system to prevent damage if the boiler is inoperative.

This boiler contains very hot water under high pressure. Do not unscrew any pipe fittings nor attempt to disconnect any components of this boiler without positively assuring the water is cool and has no pressure. Always wear protective clothing and equipment when installing, starting up or servicing this boiler to prevent scald injuries. Do not rely on the pressure and temperature gauges to determine the temperature and pressure of the boiler. This boiler contains components which become very hot when the boiler is operating. Do not touch any components unless they are cool.

Boiler materials of construction, products of combustion and the fuel contain alumina, silica, heavy metals, carbon monoxide, nitrogen oxides, aldehydes and/or other toxic or harmful substances which can cause death or serious injury and which are known to the state of California to cause cancer, birth defects and other reproductive harm. Always use proper safety clothing, respirators and equipment when servicing or working nearby the appliance.

Failure to follow all instructions in the proper order can cause personal injury or death. Read all instructions, including all those contained in component manufacturers manuals which are provided with the boiler before installing, starting up, operating, maintaining or servicing.

Keep boiler area clear and free from combustible materials, gasoline and other flammable vapors or liquids.

Do not operate boiler with control which has been subject to water.

All cover plates, enclosures and guards must be in place at all times.

NOTICE

This boiler has a limited warranty, a copy of which is printed on the back of this manual. It is the responsibility of the installing contractor to see that all controls are correctly installed and are operating properly when the installation is complete.

USA boilers built for installation at altitudes greater than 2,000 feet above sea level have been specially orificed to reduce gas input rate 4 percent per 1,000 feet above sea level per the National Fuel Gas Code, NFPA 54/ANSI Z223.1, Section 8.1.2 and Appendix F. Canadian boilers' orifice sizing is indicated on the rating label.

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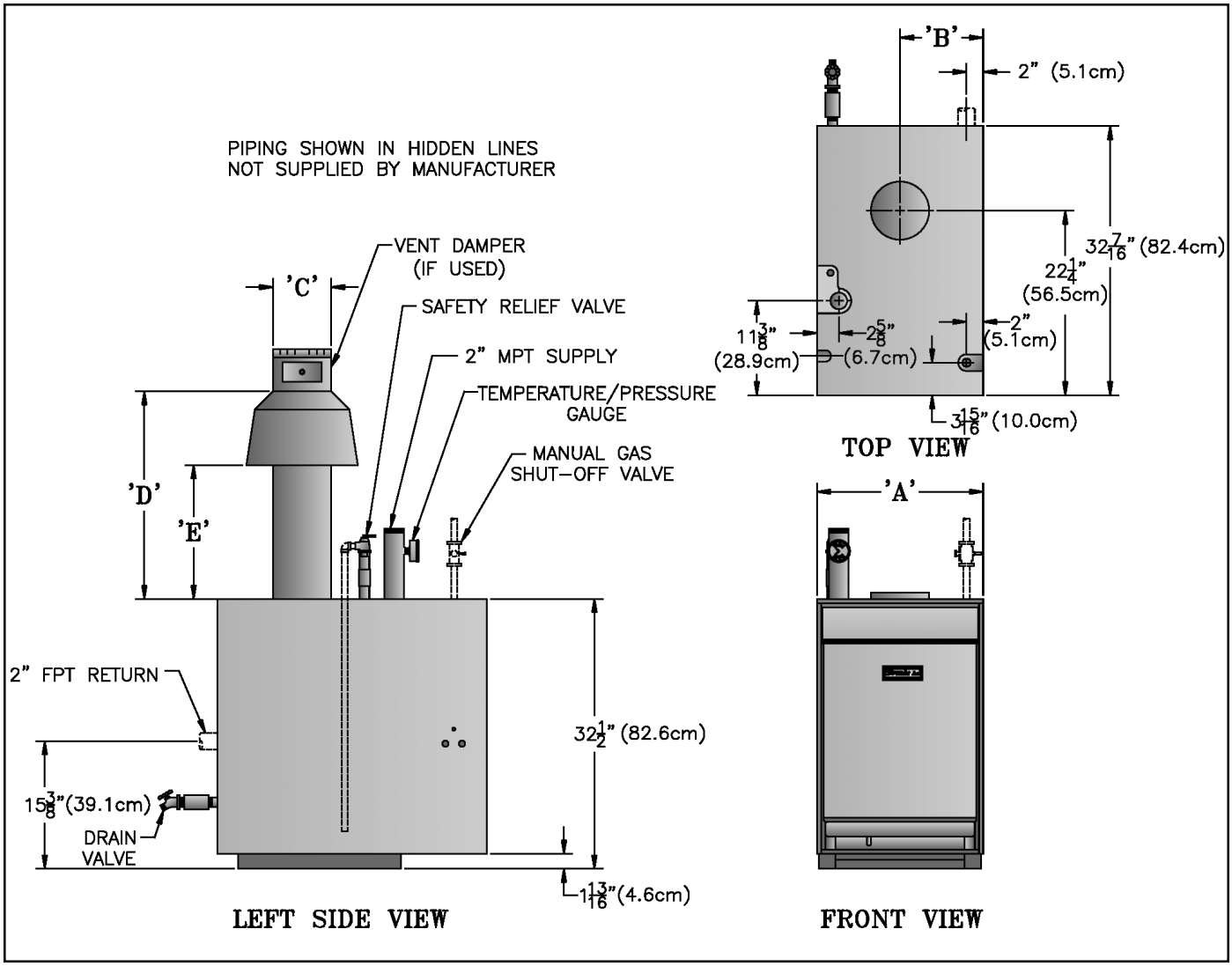


Figure 1: Dimensional Data

Table 1: Dimensional Data

Boiler Model No.	Dimensions (Inches)							Recommended Chimney Size (Round)	Water Content (Gallons)	Approx. Shipping Weight (LB)
	A	B	C	D		E				
				USA	Canada	USA	Canada			
805B	20	10	7	24-13/16	24-13/16	16-1/8	16-1/8	7" dia. x 15 ft.	11.9	690
806B	23-3/4	11-7/8	8	27-13/16	25-3/4	18	16	8" dia. x 15 ft.	13.9	770
807B	27-1/2	13-3/4	9	28-13/16	25-3/4	18	16	9" dia. x 15 ft.	15.9	875
808B	31-1/4	15-5/8	9	30-13/16	26-11/16	20	16	9" dia. x 15 ft.	17.9	980
809B	35	17-1/2	10	33-1/2	26-7/16	22	15	10" dia. x 15 ft.	19.9	1080
810B	38-3/4	19-3/8	10	33-1/2	26-7/16	22	15	10" dia. x 15 ft.	21.9	1200

(1) Special base required for installations on combustible flooring; adds 4-3/4" to boiler height (floor to jacket top panel is 37-1/4").
(2) Gas connection size: 1 NPT
(3) Maximum Allowable Working Pressure: 50 psi (Water Only)
(4) Items shown in hidden lines supplied by installer.

WARNING

Carefully read all instructions before installing boiler. Failure to follow all instructions in proper order can cause personal injury or death.

A. Inspect shipment carefully for any signs of damage. All equipment is carefully manufactured, inspected and packed. Our responsibility ceases upon delivery of boiler to carrier in good condition. Any claim for damage or shortage in shipment must be filed immediately against carrier by consignee. No claims for variances or shortages will be allowed by Boiler Manufacturer, unless presented within sixty (60) days after receipt of equipment.

B. Installation must conform to the requirements of the authority having jurisdiction. In the absence of such requirements, installation must conform to the *National Fuel Gas Code*, NFPA 54/ANSI Z223.1 and/or CAN/CGA B149 Installation Codes. Where required by the authority having jurisdiction, the installation must conform to the *Standard for Controls and Safety Devices for Automatically Fired Boilers*, ANSI/ASME No. CSD-1.

C. Provide clearance between combustible material and boiler jacket (following clearances are minimums):

1. USA, 805B-807B: listed for Alcove installation

WARNING

Appliance is design certified for installation on noncombustible flooring only. For installation on combustible flooring only when installed on special base listed in Table 2. Boiler must not be installed on carpeting. When boiler is installed on concrete which is over a material that is subject to melting (PVC, PEX radiant tubing, etc.), the special base must be used. A concrete pad is not sufficient to protect combustible flooring.

Table 2: Special Base Required for Installation on Combustible Flooring

Boiler Model No.	Special Base Part Number
805B	61816055
806B	61816065
807B	61816075
808B	61816085
809B	61816095
810B	61816105

   a. Front: 18"
   b. Top: 36"
   c. Draft hood, rear, sides and flue connector: 6"
2. USA, 808B-810B: for installation in room which is large in comparison with size of boiler.
   a. Front: 18"
   b. Top: 51½"
   c. Draft hood, rear, sides, and flue connector: 6"
3. Canada, 805B-810B:
   a. Top and front: 18" (45.7cm)
   b. Flue, rear and sides: 6" (15.2cm)

D. Provide clearance for servicing and proper operation (following clearances are recommended and may be reduced to minimum clearances shown above):

1. Single boiler, 805B-807B, Front/Top: 24" (61cm)
2. Single boiler, 808B-810B, Front/Top: 48" (122cm)
3. Multiple/modular boiler, USA/Canada, Sides: 1" (2.5cm)

E. Install boiler on level floor as close to chimney as possible. For basement installation provide a solid base such as concrete or masonry construction if floor is not level or if water may be encountered on floor around boiler.

F. Protect gas ignition system components from water (dripping, spraying, rain, etc.) during boiler operation and service (circulator replacement, control replacement, etc.).

G. Provide combustion and ventilation air in accordance with applicable provisions of local building codes, or the *National Fuel Gas Code*, NFPA 54/ANSI Z223.1, Section 5.3, Air for Combustion and Ventilation; or CAN/CGA B149 Installation Codes, Part 5, Venting Systems and Air Supply for Appliances.

WARNING

Adequate combustion and ventilation air must be provided to assure proper combustion.

The following guideline is based on the *National Fuel Gas Code*, NFPA 54/ANSI Z223.1.

1. Determine volume of space (boiler room). Rooms communicating directly with space (through permanent openings not furnished with doors) are considered part of space.
   Volume [ft³] = Length [ft] x Width [ft] x Height [ft]
2. Determine Total Input of all appliances in space.

Round result to nearest 1,000 Btu per hour (Btuh).

3. Determine type of space. Divide Volume by Total Input.

a. If result is greater than or equal to 50 ft³ per 1,000 Btuh, space is considered an *unconfined space*.

b. If result is less than 50 ft³ per 1,000 Btuh, space is considered a *confined space*.

4. Determine building type. A building of *unusually tight construction* has the following characteristics:

   a. Walls and ceiling exposed to outside atmosphere have a continuous water vapor retarder with a rating of 1 perm or less with openings gasketed and sealed, and

   b. Weather-stripping has been added on openable windows and doors, and

   c. Caulking or sealants applied in joints around window and door frames, between sole plates and floors, between wall-ceiling joints, between wall panels, at plumbing and electrical penetrations, and at other openings.

5. For boiler located in an *unconfined space in a building of other than unusually tight construction*, adequate combustion and ventilation air is normally provided by fresh air infiltration through cracks around windows and doors.

6. For boiler located in an *unconfined space in a building of unusually tight construction* or in a *confined space*, provide outdoor air through permanent opening(s) which communicate directly or by duct with the outdoors or spaces (crawl or attic) freely communicating with the outdoors. Minimum dimension of air opening(s) is 3" (7.6cm).

   a. Two permanent openings: Locate one opening within 12 " (30.5cm) of top of space. Locate remaining opening within 12" (30.5cm) of bottom of space. Size each opening per following:

      i. Direct communication with outdoors. Minimum free area of each opening must be 1 square inch per 4,000 Btu per hour input of all equipment in space.

      ii. Vertical ducts. Minimum free area of each opening must be 1 square inch per 4,000 Btu per hour input of all equipment in space. Duct cross-sectional area shall be same as opening free area.

      iii. Horizontal ducts. Minimum free area of each opening must be 1 square inch per 2,000 Btu per hour input of all equipment in space. Duct cross-sectional area shall be same as opening free area.

   b. One permanent opening shall be permitted where the boiler has clearances of at least 1" (2.5cm) from the sides and rear and 6" (15.2cm) from the front. Locate the opening within 12 " (30.5cm) of top of space. Size opening per following:

      i. Minimum free area of 1 square inch per 3,000 Btu per hour input of all equipment in space.

      ii. Free area shall not be less than the sum of the areas of all vent connectors in the confined space.

   Alternate method for boiler located within confined space. Use indoor air if two permanent openings communicate directly with additional space(s) of sufficient volume such that combined volume of all spaces meet criteria for unconfined space. Size each opening for minimum free area of 1 square inch per 1,000 Btu per hour input of all equipment in spaces, but not less than 100 square inches.

7. Ventilation Duct Louvers and Grilles. Equip outside openings with louvers to prevent entrance of rain and snow, and screens to prevent entrance of insects and rodents. Louvers and grilles must be fixed in open position or interlocked with equipment to open automatically before burner operation. Screens must not be smaller than ¼ inch mesh.

   Consider the blocking effect of louvers, grilles and screens when calculating the opening size to provide the required free area. If free area of louver or grille is not known, assume wood louvers have 20-25 percent free area and metal louvers and grilles have 60-75 percent free area.

8. For Specially Engineered Installations. The above requirements shall be permitted to be waived where special engineering, consistent with good engineering practice and approved by the authority having jurisdiction, provides an adequate supply of air for combustion, ventilation, and dilution of flue gases.

WARNING

Do not install boiler where gasoline or other flammable vapors or liquids, or sources of hydrocarbons (i.e. bleaches, cleaners, chemicals, sprays, paint removers, fabric softeners, etc.) are used or stored.

NOTICE

Mis-sizing of the boiler with regard to the heating system load will result in excessive boiler cycling and accelerated component failure. Burnham DOES NOT warrant failures caused by mis-sized boiler applications. DO NOT oversize the boiler to the system. Modular/multiple boilers greatly reduce the likelihood of boiler oversizing.

II. Boiler Assembly

A. Remove Crate (Semi-Pak and Packaged Only)

1. Remove all fasteners at crate skid.
2. Lift outside container and remove with all other inside protective spacers and bracing.

B. Remove boiler from skid. See Figure 2. Exercise care to avoid dropping boiler.

1. Place boiler in approximate location. Refer to Section I: Pre-Installation. Remove base hold down bolts.
2. Using pry bar under rear corner of Base End Panel, raise boiler and install 1½" wood blocks under rear corners. Install ¾" pipe roller between Base and skid.
3. Remove 1½" wood blocks. Place 3" pipe roller on floor behind skid.
4. Roll boiler off skid. Move skid out of way.

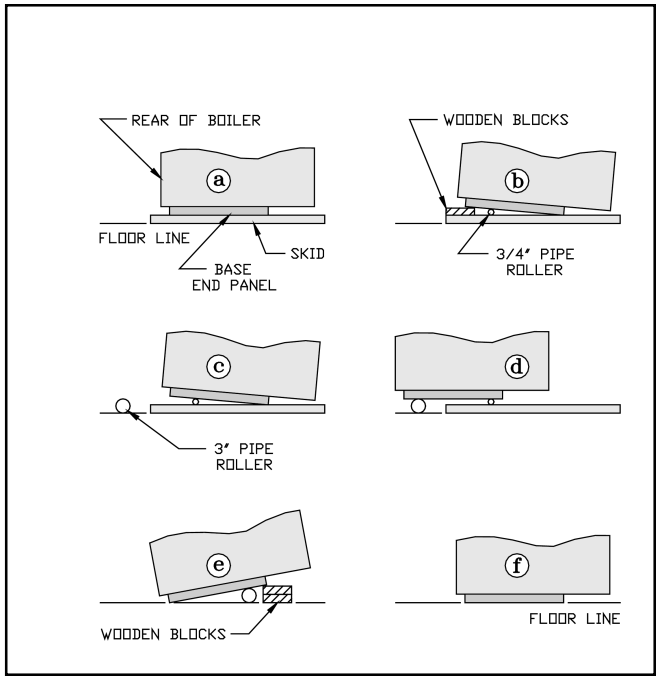


Figure 2: Skid Removal

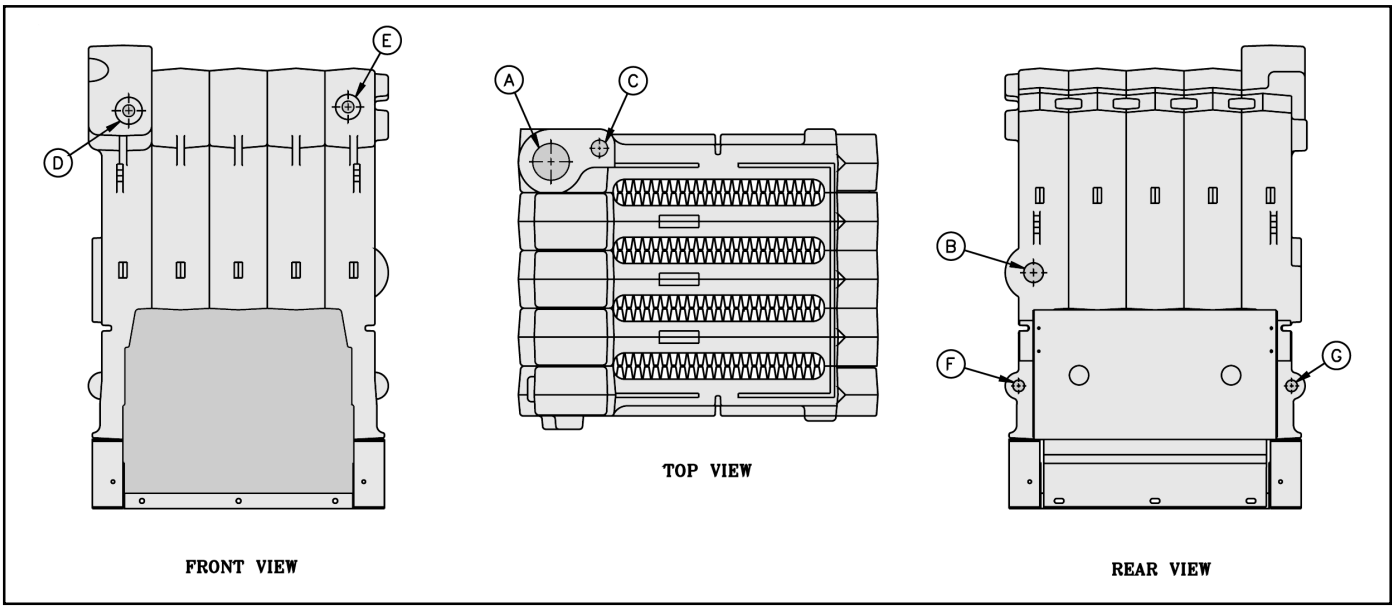


Figure 3: Tapping Locations

Table 3: Purpose of Tappings

Tapping	Size	Purpose
A	2"	Supply
B	2"	Return
C	¾"	Relief Valve
D	¾"	Limit
E	¾"	Auxiliary Limit
F	¾"	Washout
G	¾"	Drain

5. Roll boiler until 3" roller is located as shown. Use pry bar to install wood blocks under front corners of base. Remove 3" roller.
6. Lift boiler with pry bar. Remove wood blocks. Lower boiler.

C. For Packaged Boiler only, proceed to Paragraph E.

D. Test Section Assembly for leaks before connecting to system and installing controls, trim and jacket. Refer to Figure 3 and Table 3.

1. Plug Tappings C & E (¾ NPT) and Return Tapping B (2 NPT).
2. Insert ¾" NPT x ¼" NPT bushing in Tapping D. Install pressure gauge capable of indicating 50 psi.
3. Insert 2" NPT x ¾" NPT bushing in Supply Tapping A. Install purge valve with a hose that runs to a drain.
4. Connect fill valve and piping to Drain Tapping G.

WARNING

Do not use air to leak test boiler.

5. Fill boiler completely with water by venting air through purge valve. Close purge valve and apply water pressure of at least 10 psi but less than 50 psi gauge pressure.
6. Examine boiler for leaks or damage due to shipment or handling.
7. Remove plugs from Return Tapping B, Tapping C, and Tapping E (if second limit or operating control is used). Also remove fill valve and piping, purge valve and piping, and pressure gauge.

E. Install special base if installation is on combustible flooring. See Figure 4. Floor shield adds 4¾" to boiler height.

1. Place special base on combustible floor with surface marked "FRONT" in upward position.
2. Locate special base with spacing to combustible materials as shown in Figure 4.
3. Place boiler on special base. Boiler must rest inside locating brackets. Boiler jacket panels will overhang special base.
4. Do not enclose boiler (including special base) on all four sides. Models 805B - 807B may be enclosed

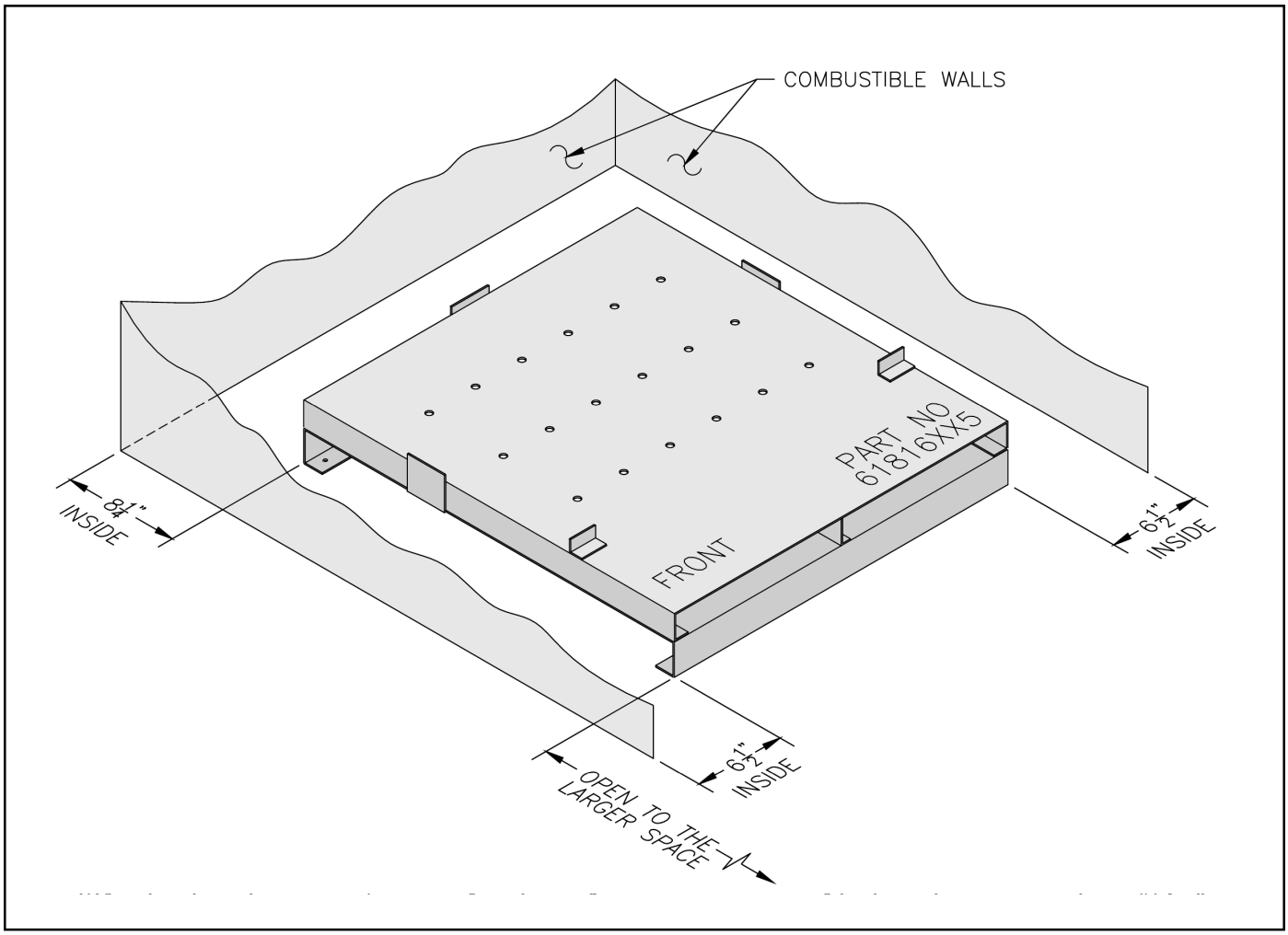


Figure 4: Installation of Special Base for Combustible Flooring

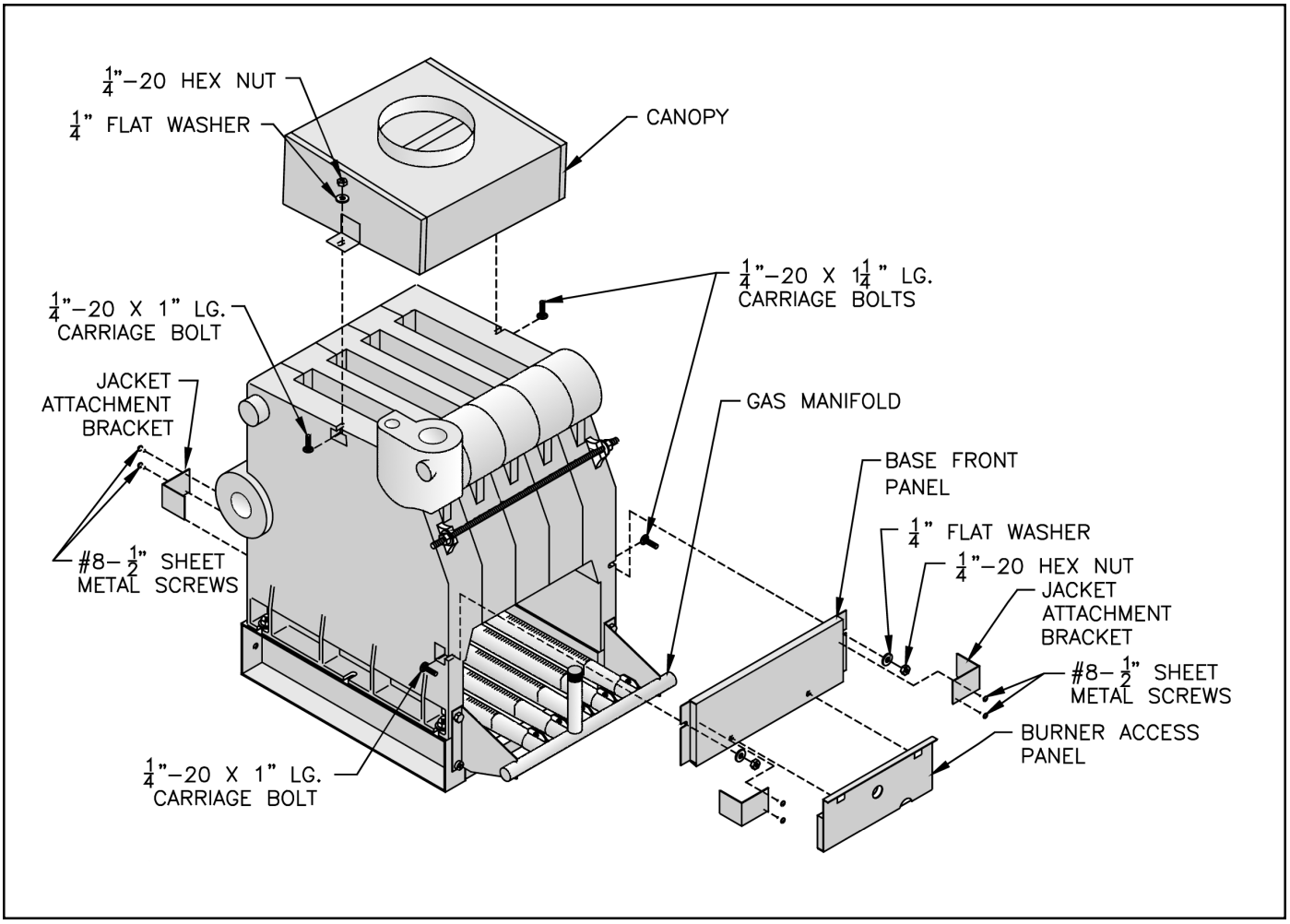


Figure 5: General Assembly (Knockdown Boilers)

on three sides (alcove) while maintaining clearances shown in Figure 4.

F. **Move boiler to permanent location** by sliding or walking. DO NOT DROP.

For Packaged Boiler proceed to Section IV: Trim and Piping.

G. **Install Canopy** on section assembly. See Figure 5. Canopy and hardware are located in Combination Boiler Parts and Control Carton.

1. Position Canopy on top of Section Assembly. Locate between end sections and sealing ledge on front and back of each section.
2. Fasten each end with ¼" - 20 x 1" carriage bolts, washers and nuts.
3. Seal between Canopy and Section Assembly with furnace cement.

H. **Inspect joints between sections.** They were factory sealed. If any openings resulted during shipment or handling, reseal with furnace cement. Confirm tie rods are only hand tight to allow for thermal expansion.

I. **Install Base Front Panel.** See Figure 5. Panel and hardware located in Combination Boiler Parts and Control Carton.

1. Attach Base Front Panel to Section Assembly using ¼" - 20 x 1¼" carriage bolts, washers and nuts.
2. Seal between top of Base Front Panel and Section Assembly with furnace cement (shipped in Combination Boiler Parts and Control Carton).
3. Seal between top of Base Rear Panel and Section Assembly with furnace cement.

J. **Install Pilot/Main Burner Assembly.** See Figure 7. Assembly is located in Combination Boiler Parts and Control Carton. Verify assembly is properly located on support bracket in Base Rear Panel, seated on Main Burner Orifice, and secured with hitch pin clip.

K. **Attach Flame Roll-out Switch** to Burner Access Panel. See Figure 6. Flame Roll-out Switch and hardware are located in Combination Boiler Parts and Control Carton. Flame Roll-out Switch is a single use device - do not test with heat - switch cannot be reset.

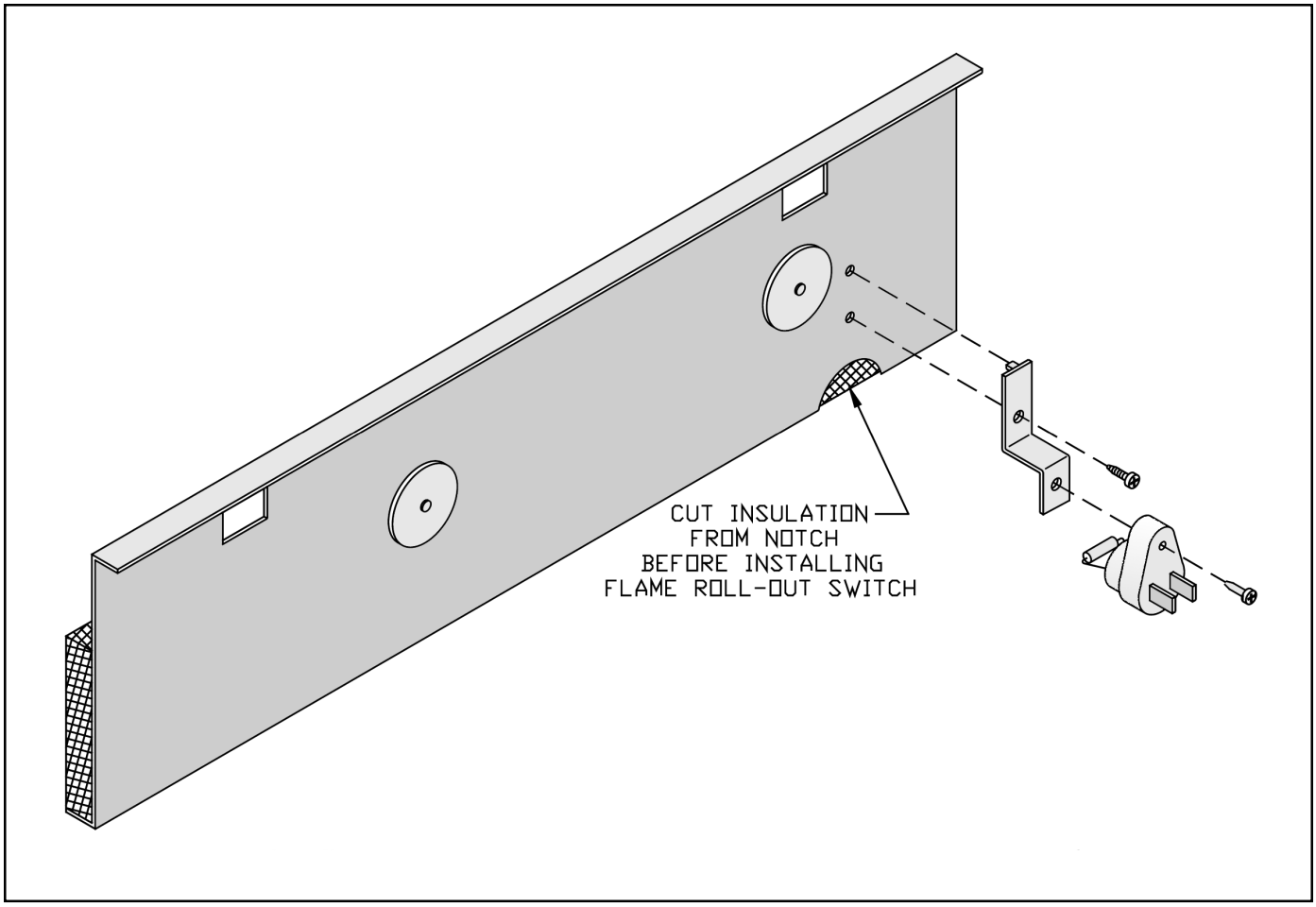


Figure 6: Flame Roll-out Switch Installation

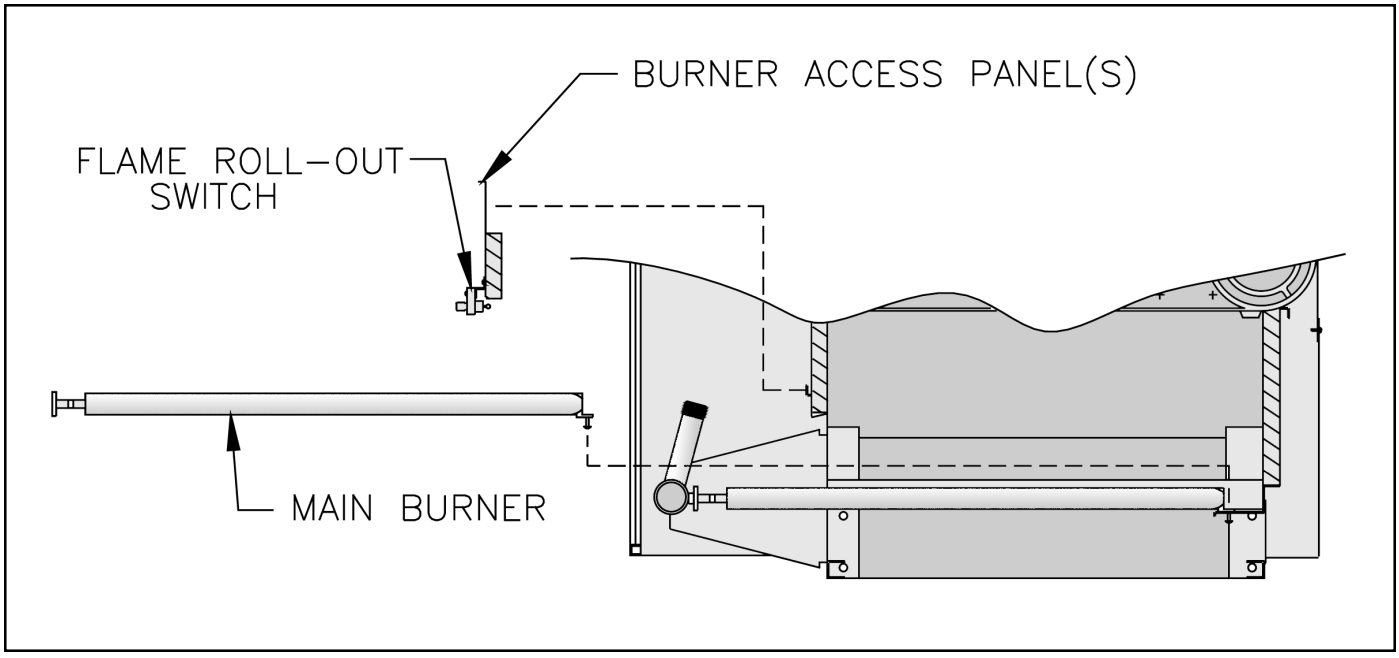


Figure 7: Burner/Burner Access Panel Installation

1. Cut insulation from semicircular notch at right end of the burner access panel. Models 808B - 810B have two (2) burner access panels. Remove insulation from notch of right side burner access panel only.
2. Attach Flame Roll-out Switch Mounting Bracket to burner access panel with (1) #8 x ½" lg. sheet metal screw.
3. Attach Flame Roll-out Switch to mounting bracket with (1) #8 x ¾" lg. sheet metal screw.

L. Install Burner Access Panel(s). Locate Burner Access Panel(s) in Combination Boiler Parts and Control Carton. Engage Burner Access Panel holes with projections on Base Front Panel. See Figure 6.

M. Install Immersion Well(s).

1. Remove Immersion Well(s) from Combination Boiler Parts and Control Carton..
2. Insert Immersion Well in Tapping D. See Figure 3.
3. If second limit or operating control is used, insert immersion well in Tapping E. If vertical gas piping is to be installed inside of boiler jacket, it is recommended that second limit be installed in system piping.

N. Install Jacket. See Figure 8.

1. Locate four (4) Jacket Attachment Brackets in Combination Boiler Parts and Control Carton. Attach to Front Base Panel and Rear Base Panels with #8 sheet metal screws. See Figure 5.
2. Hang Left Side Panel and Right Side Panel onto Jacket Attachment Brackets.
3. Attach Lower Rear Panel to Left and Right Side Panels. Do not tighten sheet metal screws.
4. Attach Upper Rear Panel to Lower Rear Panel. Do not install three (3) upper screws.
5. Remove Rating Label and Combustible Clearance Label from Combination Boiler Parts and Control Carton. Attach to Vestibule Panel in locations shown.
6. Attach Vestibule Panel to Left Side and Right Side Panels.
7. Attach Lower Front Tie Bar to Left Side and Right Side Panels.
8. Engage Upper Front Panel in slots on Left Side and Right Side Panels. Place Top Panel in position. Attach Top Panel to Left Side, Right Side and Upper Rear Panels.
9. Tighten all jacket screws.
10. Affix Lighting/Operating Instructions Label and Wiring Diagram Label to inside of Front Removable Door. Labels are located in Combination Boiler Parts and Control Carton.

O. Install Junction Box. See Figure 8. Attach junction box to inside of Left Side Panel with ¼" - 20 x ¼" lg. machine screw (located in Combination Boiler Parts and Control Carton).

P. Install Limit Control. Locate limit in Combination Boiler Parts and Control Carton. Insert limit probe into left immersion well as far as possible. Tighten set screw.

Q. Install Auxiliary Limit or operating control (if used). Insert control probe into right immersion well as far as possible. Tighten set screw.

R. Install Gas Control Assembly. Refer to Section III, Gas Control System Assembly (Knockdown Boilers).

S. EP and OP System: See Figure 9.

1. Install pre-wired EP/OP Control Cabinet Assembly to right front corner of jacket top panel.
2. Install Honeywell RM7890 Control (located in RM7890 Control Carton).
3. Remove RM7890's Dust Cover. With a pair of side cutters, carefully snip both wire leads to the brown resistor labelled "JR2" and discard it. Replace Dust Cover.
4. Install Honeywell R7847 Flame Amplifier.
5. Install heat shield.

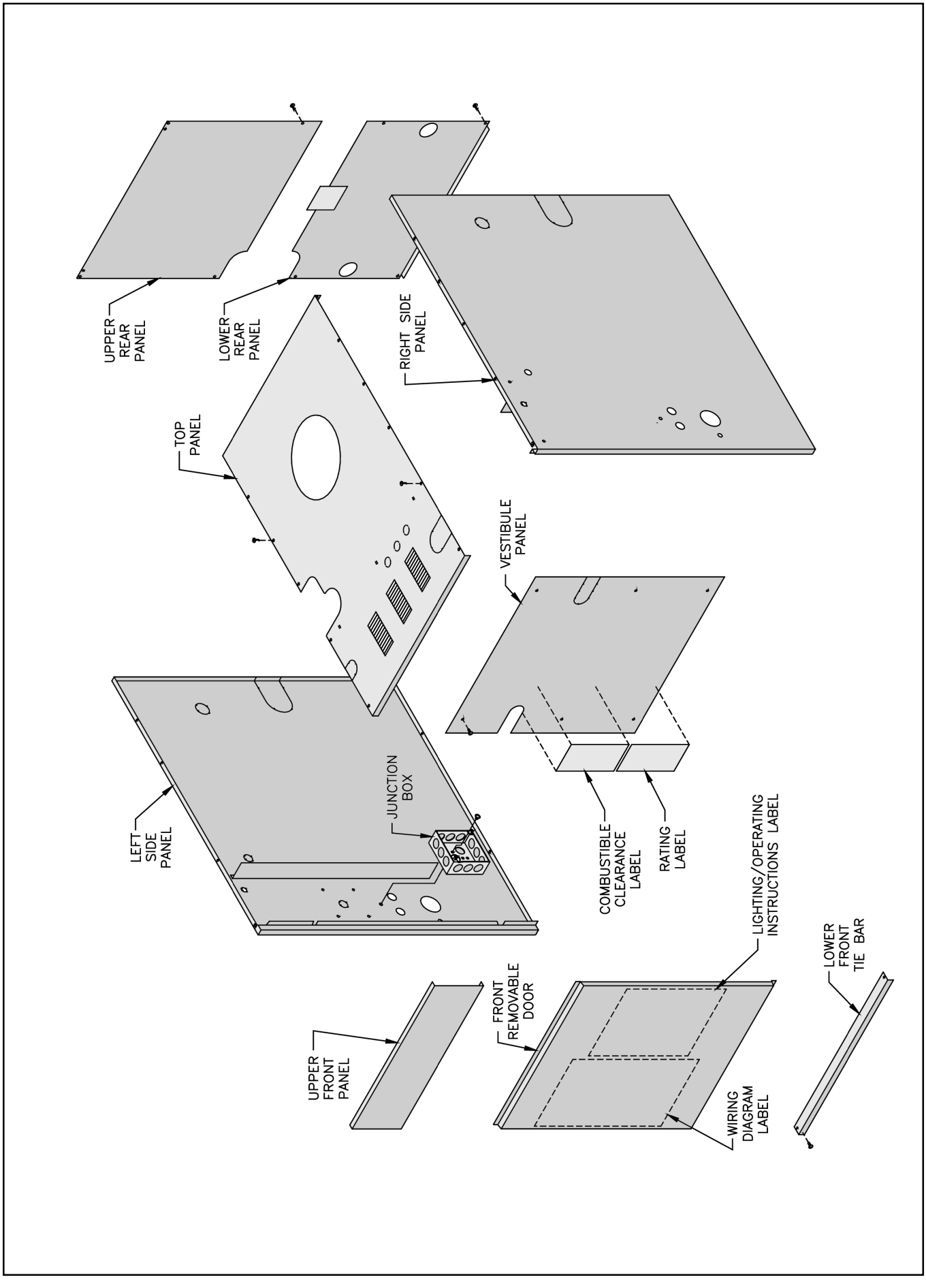


Figure 8: Jacket Assembly

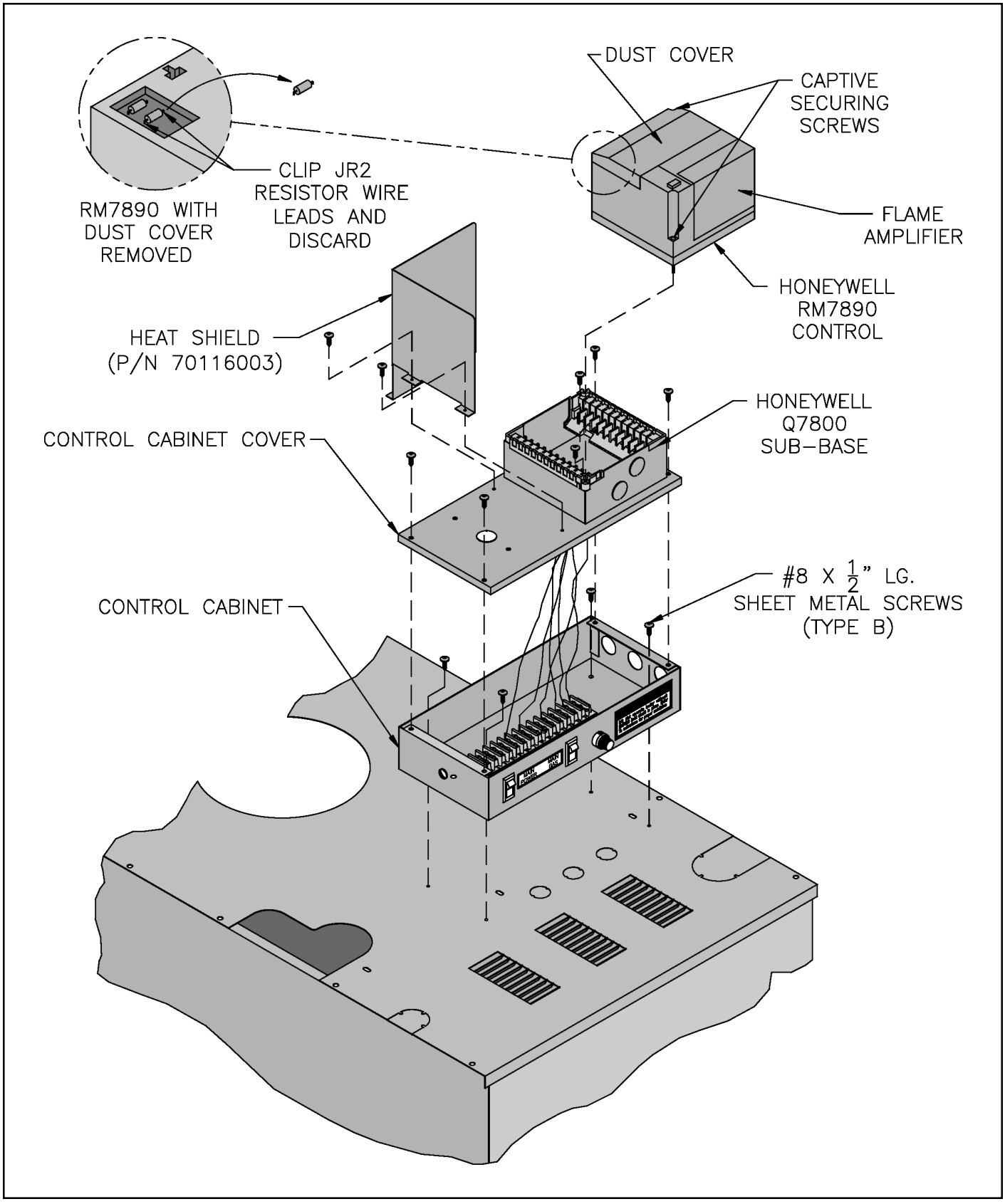


Figure 9: EP/OP Control Installation

III. Gas Control System Assembly (Knockdown Boilers)

A. 24V Standing Pilot Control System

Install Gas Control System. All components are located in Combination Boiler Parts and Control Carton.

1. Install Gas Control Assembly on Manifold. See Figure 10. Use thread (joint) compound (pipe dope) resistant to action of liquefied petroleum gas.
2. Install pilot burner piping and controls. See Figure 10.
3. Connect Thermocouple Lead to Gas Valve.
4. Mount Transformer (continuous circulation) or Control Center (intermittent circulation) to Junction Box.
   a. Canada only - loop 4" nylon cable tie between junction box and transformer/control center.
   b. Attach transformer/control center to junction box.

B. EI (Intermittent Ignition)

Install Gas Control System. All components are located in Combination Boiler Parts and Control Carton.

1. Install Gas Control Assembly on Manifold. See Figure 11. Use thread (joint) compound (pipe dope) resistant to action of liquefied petroleum gas.
2. Install pilot burner piping and controls.
   a. Honeywell EI
      i. USA - See Figure 12.
      ii. Canada - See Figure 13.
   b. Johnson EI
      i. USA - See Figure 14.
      ii. Canada - See Figure 15.
3. Install Ignition Module.
   a. Attach Ignition Control Mounting Bracket to Jacket Vestibule Panel using two (2) #8 x ½" sheet metal screws.
   b. Attach Johnson Ignition Module to Mounting Bracket using two (2) #6 x ¾" sheet metal screws or attach Honeywell Ignition Module to Mounting Bracket using two (2) #8 x ½" sheet metal screws.
   c. Connect pilot ground wire and ignitor/sensor lead(s) to ignition module. Refer to "Section VII: Electrical" for connection details.
4. Mount Transformer (continuous circulation) or Control Center (intermittent circulation) to Junction Box. See Figure 8.
   a. Canada only - loop 4" nylon cable tie between junction box and transformer/control center.
   b. Attach transformer/control center to junction box.

C. OP Control System

Install Gas Control System. All components are located in Combination Boiler Parts and Control Carton.

1. Install Gas Control Assembly on Manifold. See Figure 16. Use thread (joint) compound (pipe dope) resistant to action of liquefied petroleum gas.
2. Install pilot burner piping and controls. See Figure 16.
3. Connect Thermocouple Lead to Gas Valve.
4. Mount Transformer (continuous circulation) or Control Center (intermittent circulation) to Junction Box.
   a. Canada only - loop 4" nylon cable tie between junction box and transformer/control center.
   b. Attach transformer/control center to junction box.

D. OP-CSD-1 Control System

Install Gas Control System. All components are located in Combination Boiler Parts and Control Carton.

1. Install Gas Control Assembly on Manifold. See Figure 17. Use thread (joint) compound (pipe dope) resistant to action of liquefied petroleum gas.
2. Mount pilot switch.
3. Install pilot burner piping and controls. See Figure 17.
4. Connect Thermocouple lead to pilot switch.
5. Mount Transformer (continuous circulation) or Control Center (intermittent circulation) to Junction Box.
6. Attach transformer/control center to junction box.

E. EP Control System

Install Gas Control System. All components are located in Combination Boiler Parts and Control Carton.

1. Install Gas Control Assembly on Manifold. See Figure 18.
2. Install pilot burner piping and controls. See Figure 18.
3. Install Ignition Transformer.
   a. Attach Ignition Transformer to Jacket Vestibule Panel using four (4) #8 x ½" lg. sheet metal screws.
   b. Connect Ignition Lead from Pilot to Ignition Transformer.
4. Mount Transformer (continuous circulation) or Control Center (intermittent circulation) to Junction Box.
   a. Canada only - loop 4" nylon cable tie between junction box and transformer/control center.

b. Attach transformer/control center to junction box.

F. EP-CSD-1 Control System

Install Gas Control System. All components are located in Combination Boiler Parts and Control Carton.

1. Install Gas Control Assembly on Manifold. See Figure 19.
2. Install pilot burner piping and controls. See Figure 19.
3. Install Ignition Transformer.
   a. Attach Ignition Transformer to Jacket Vestibule Panel using four (4) #8 x ½" lg. sheet metal screws.
   b. Connect Ignition Lead from Pilot to Ignition Transformer.
4. Mount Transformer (continuous circulation) or Control Center (intermittent circulation) to Junction Box.
   a. Canada only - loop 4" nylon cable tie between junction box and transformer/control center.
   b. Attach transformer/control center to junction box.

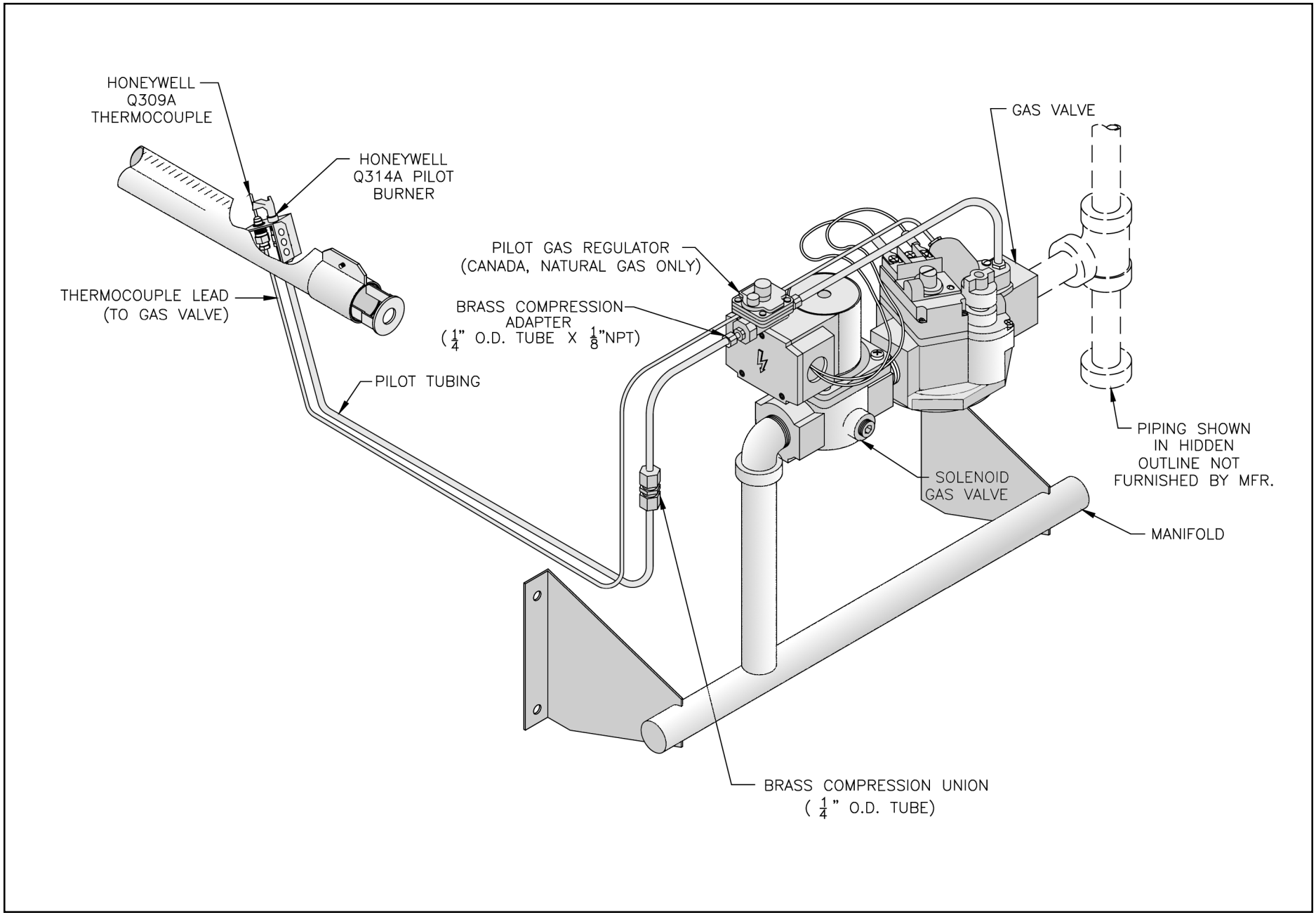


Figure 10: Schematic Gas Piping, 24V Standing Pilot, 806B & 807B

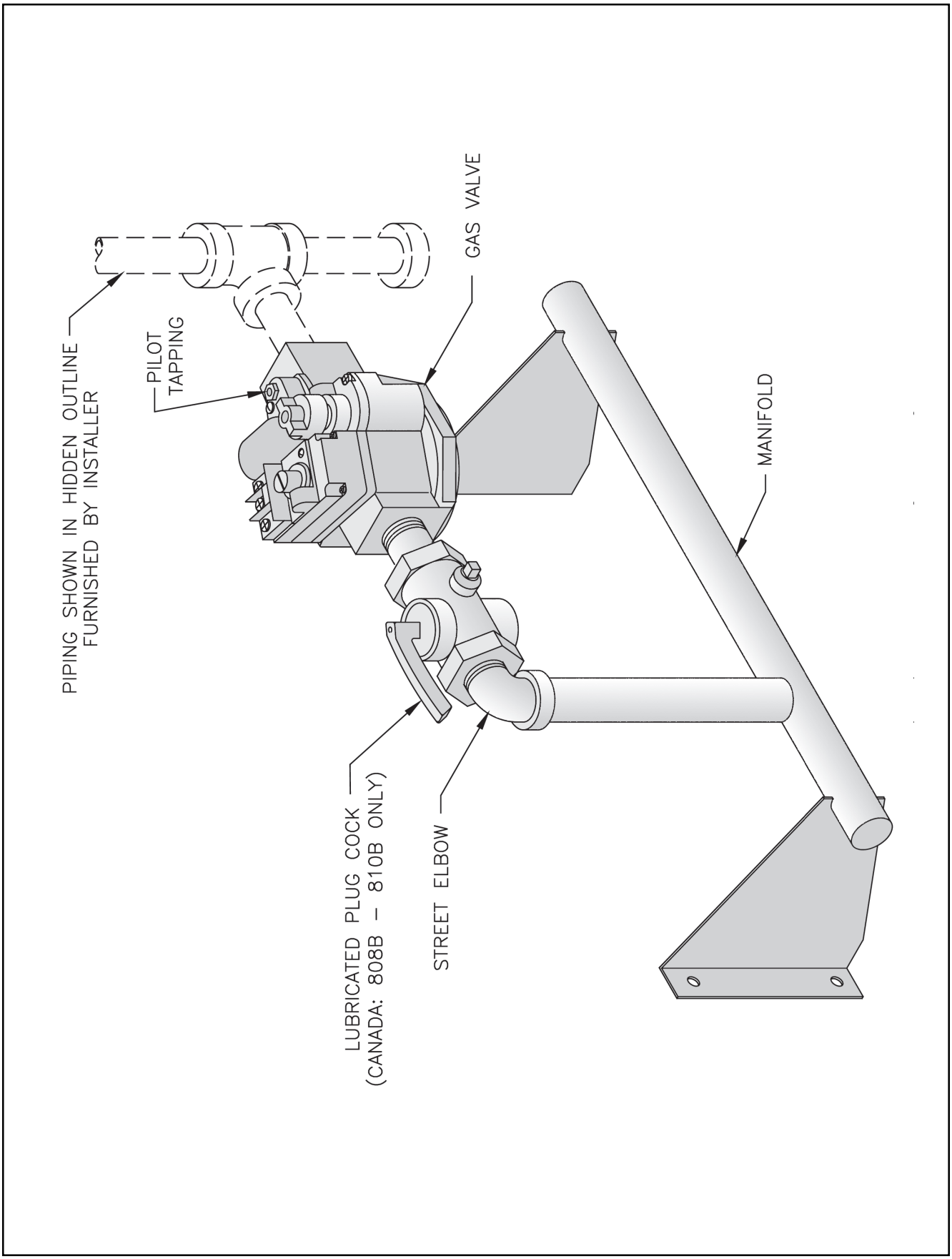


Figure 11: Main Gas Piping, Intermittent Ignition (EI)

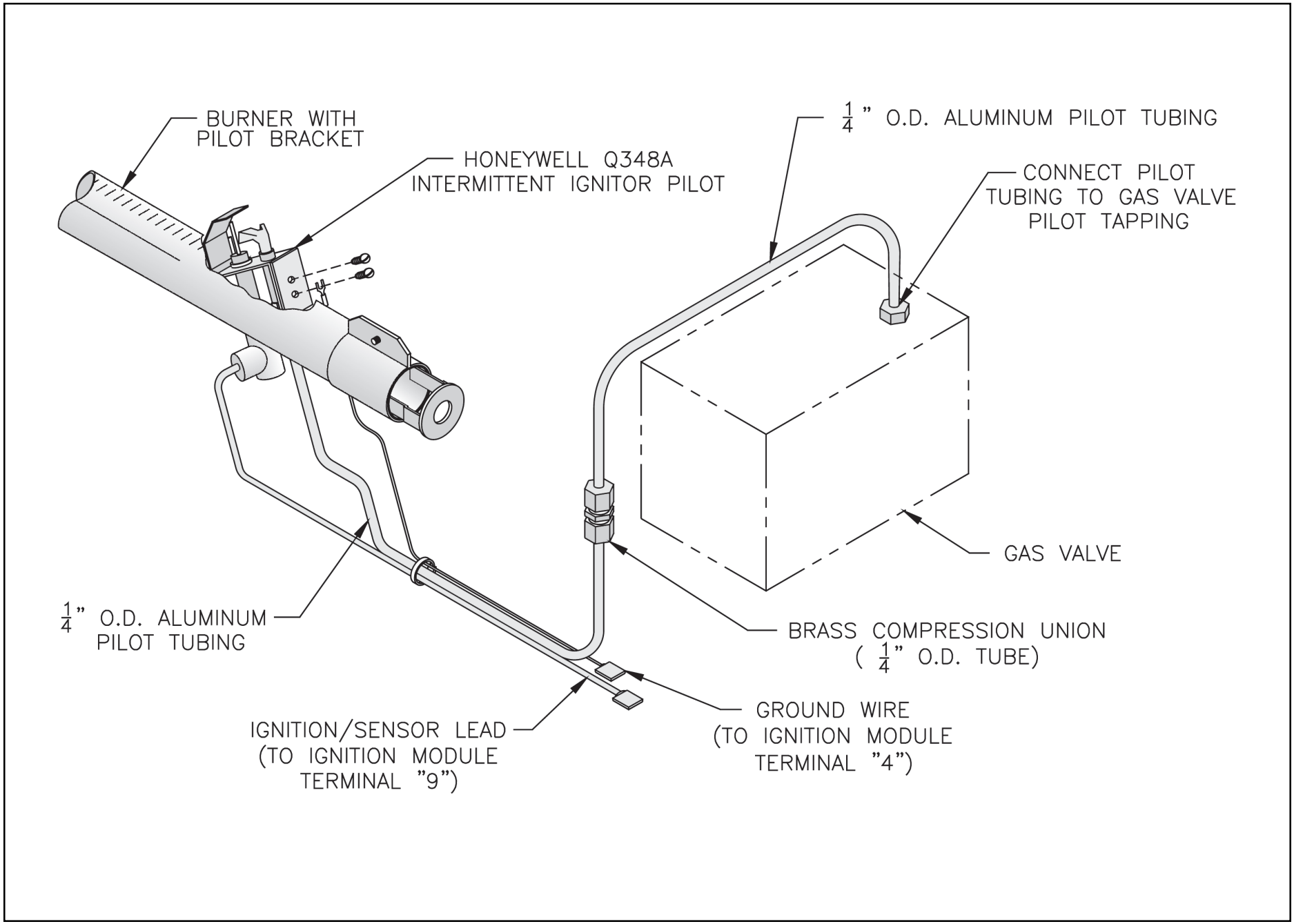


Figure 12: Schematic Pilot Piping (Honeywell EI), USA

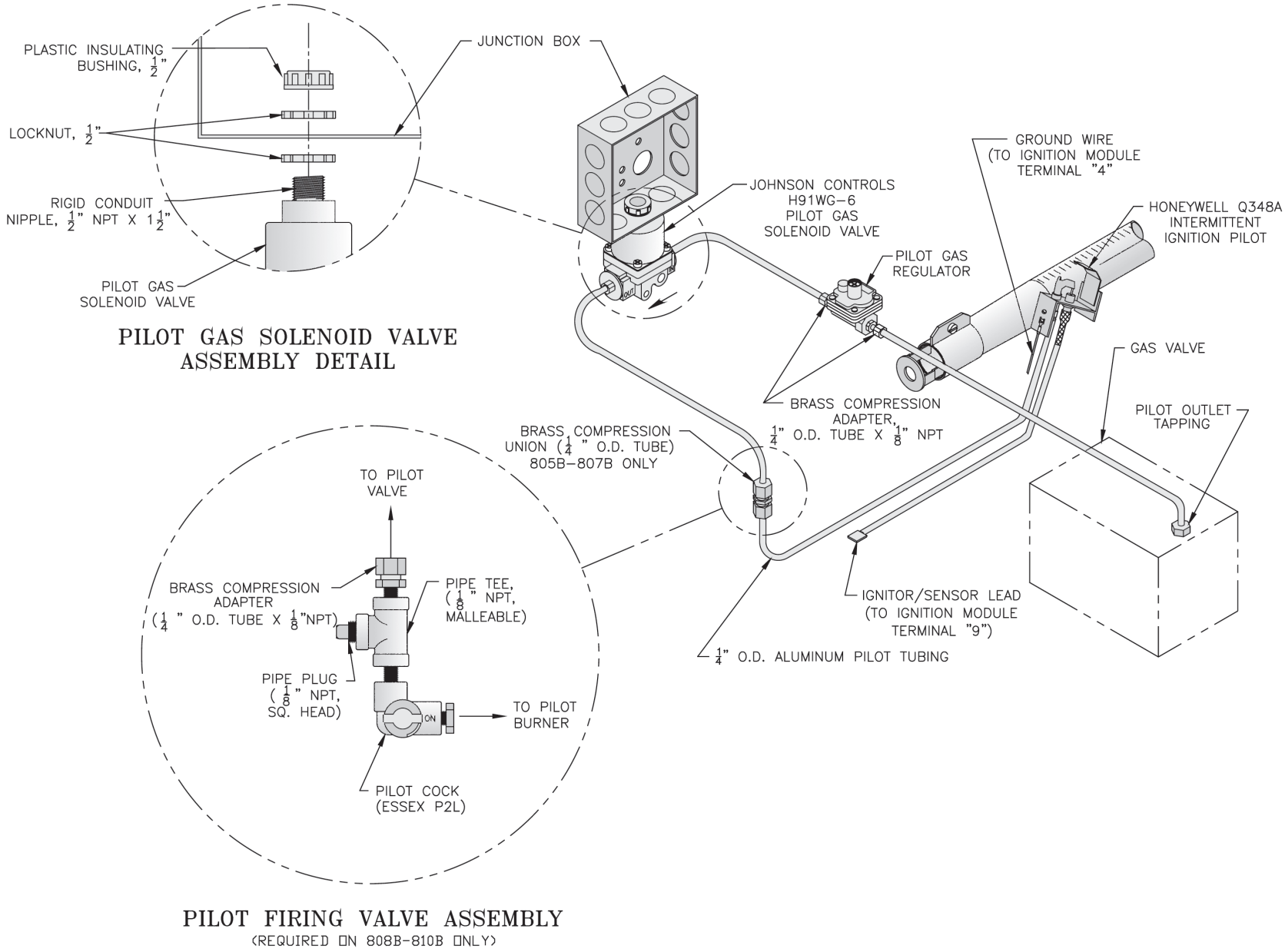

PLASTIC INSULATING BUSHING, 1/2"
LOCKNUT, 1/2"
RIGID CONDUIT NIPPLE, 1/2" NPT X 1 1/2"
PILOT GAS SOLENOID VALVE
PILOT GAS SOLENOID VALVE ASSEMBLY DETAIL
JUNCTION BOX
JOHNSON CONTROLS H91WG-6 PILOT GAS SOLENOID VALVE
GROUND WIRE (TO IGNITION MODULE TERMINAL "4"
HONEYWELL Q348A INTERMITTENT IGNITION PILOT
PILOT GAS REGULATOR
GAS VALVE
BRASS COMPRESSION ADAPTER, 1/4" O.D. TUBE X 1/8" NPT
PILOT OUTLET TAPPING
BRASS COMPRESSION UNION (1/4" O.D. TUBE) 805B-807B ONLY
TO PILOT VALVE
BRASS COMPRESSION ADAPTER (1/4" O.D. TUBE X 1/8"NPT)
PIPE TEE, (1/8" NPT, MALLEABLE)
PIPE PLUG (1/8" NPT, SQ. HEAD)
ON
TO PILOT BURNER
PILOT COCK (ESSEX P2L)
IGNITOR/SENSOR LEAD (TO IGNITION MODULE TERMINAL "9")
1/4" O.D. ALUMINUM PILOT TUBING
PILOT FIRING VALVE ASSEMBLY
(REQUIRED ON 808B-810B ONLY)

Figure 13: Schematic Pilot Piping (Honeywell EI)
Canada: Natural Gas, 805B - 810B; LP Gas, 806B - 807B

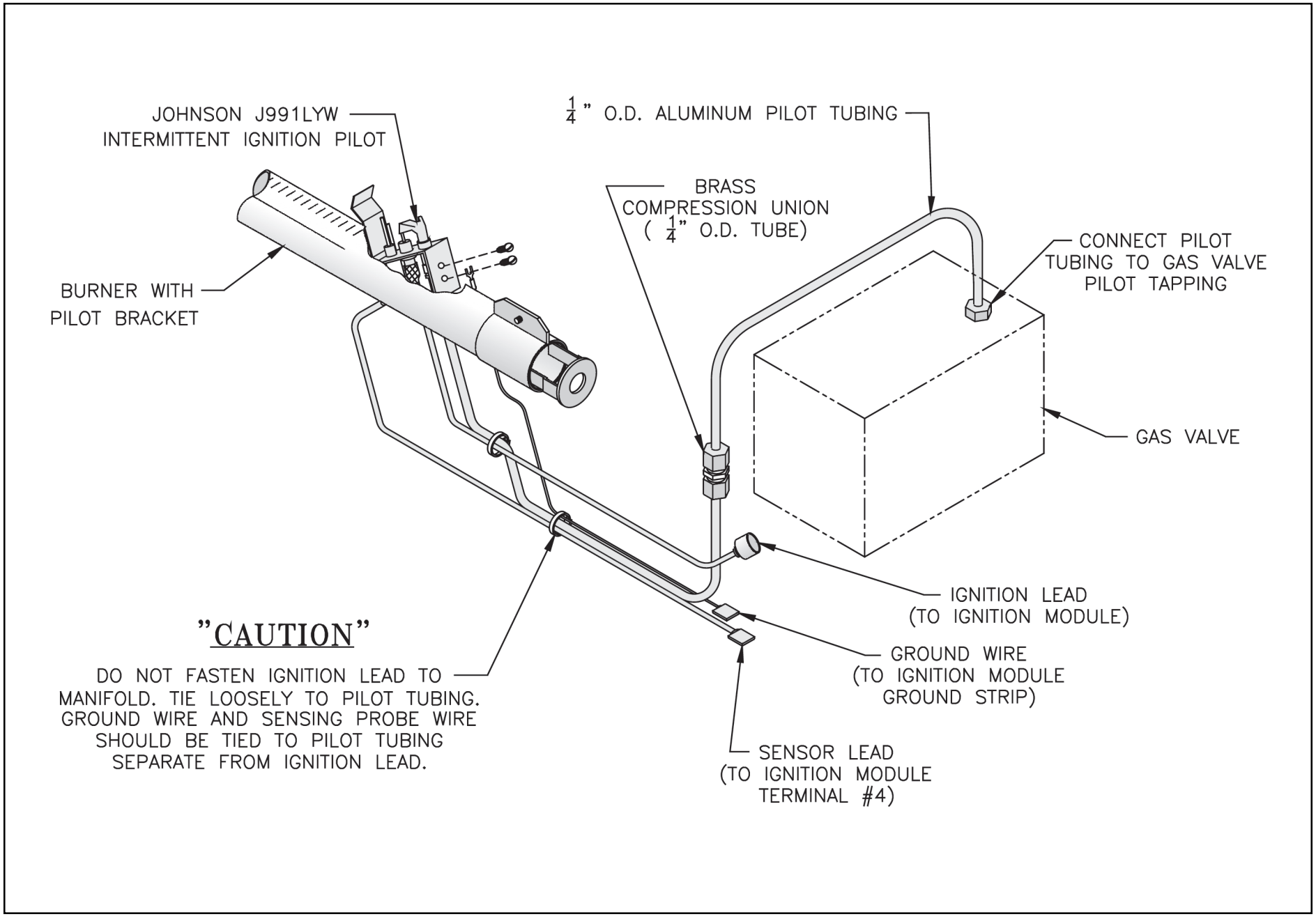


Figure 14: Schematic Pilot Piping (Johnson EI), USA

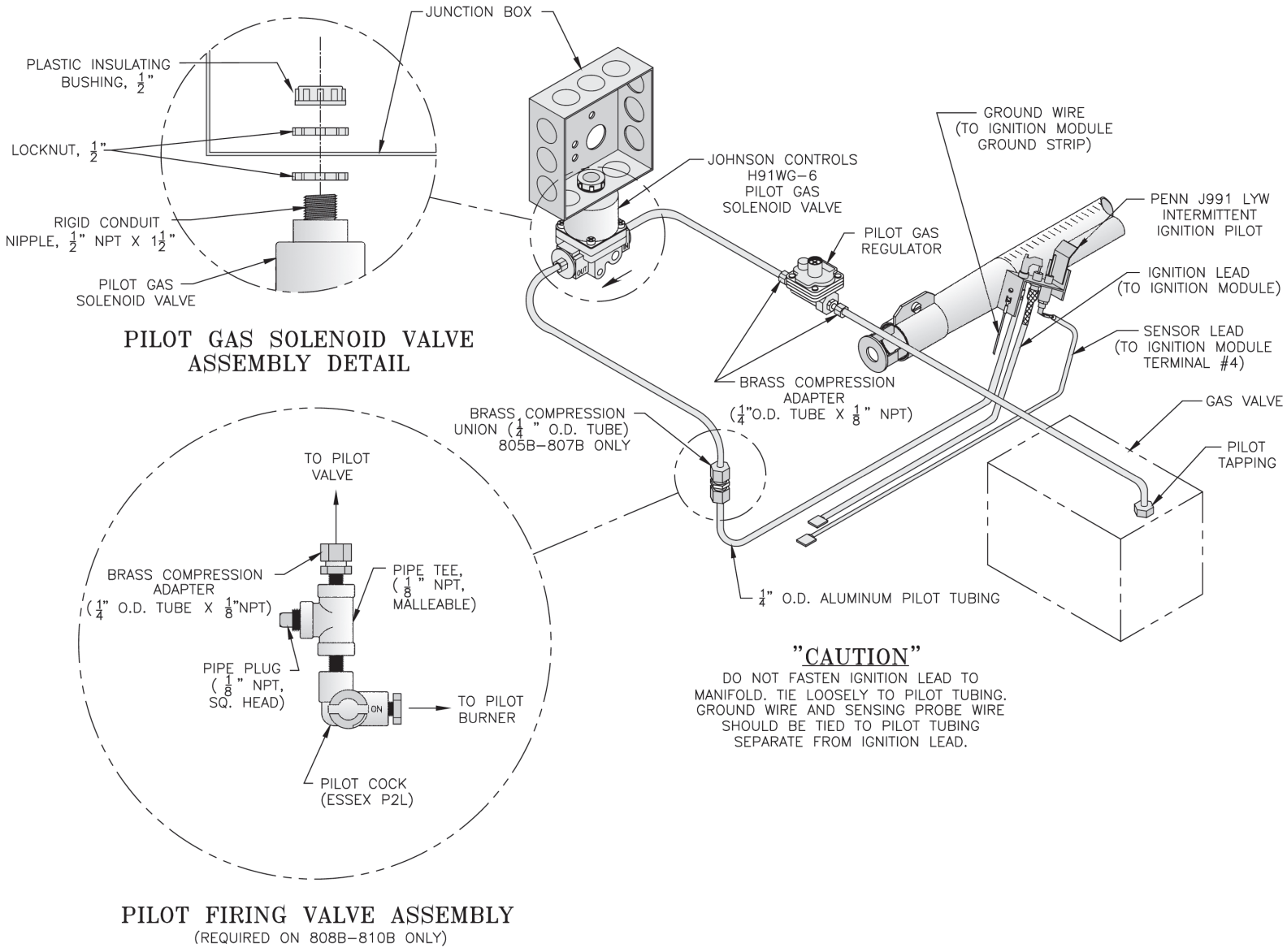
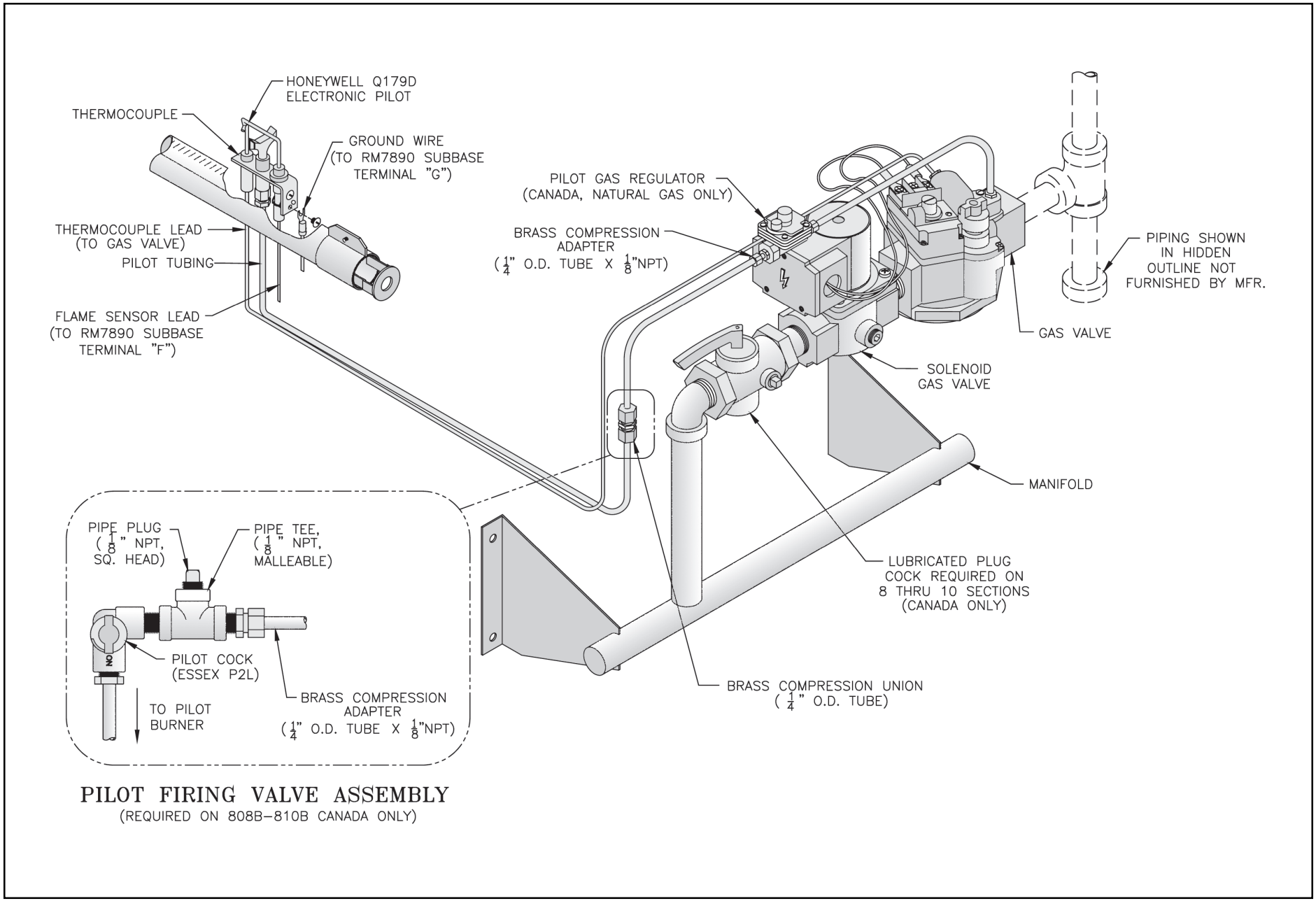

JUNCTION BOX
PLASTIC INSULATING BUSHING, 1/2"
LOCKNUT, 1/2"
RIGID CONDUIT NIPPLE, 1/2" NPT X 1 1/2"
PILOT GAS SOLENOID VALVE
PILOT GAS SOLENOID VALVE ASSEMBLY DETAIL
JOHNSON CONTROLS H91WG-6 PILOT GAS SOLENOID VALVE
GROUND WIRE (TO IGNITION MODULE GROUND STRIP)
PENN J991 LYW INTERMITTENT IGNITION PILOT
PILOT GAS REGULATOR
IGNITION LEAD (TO IGNITION MODULE)
SENSOR LEAD (TO IGNITION MODULE TERMINAL #4)
BRASS COMPRESSION ADAPTER (1/4"O.D. TUBE X 1/8" NPT)
BRASS COMPRESSION UNION (1/4" O.D. TUBE) 805B-807B ONLY
GAS VALVE
PILOT TAPPING
TO PILOT VALVE
BRASS COMPRESSION ADAPTER (1/4" O.D. TUBE X 1/8"NPT)
PIPE TEE, (1/8" NPT, MALLEABLE)
PIPE PLUG (1/8" NPT, SQ. HEAD)
ON
TO PILOT BURNER
PILOT COCK (ESSEX P2L)
1/4" O.D. ALUMINUM PILOT TUBING
"CAUTION"
DO NOT FASTEN IGNITION LEAD TO MANIFOLD. TIE LOOSELY TO PILOT TUBING. GROUND WIRE AND SENSING PROBE WIRE SHOULD BE TIED TO PILOT TUBING SEPARATE FROM IGNITION LEAD.
PILOT FIRING VALVE ASSEMBLY
(REQUIRED ON 808B-810B ONLY)

Figure 15: Schematic Pilot Piping (Johnson EI)
Canada: Natural Gas, 805B - 810B; LP Gas, 806B - 807B



PILOT FIRING VALVE ASSEMBLY
(REQUIRED ON 808B–810B CANADA ONLY)

Figure 16: Schematic Gas Piping, OP Control System, 806B - 810B

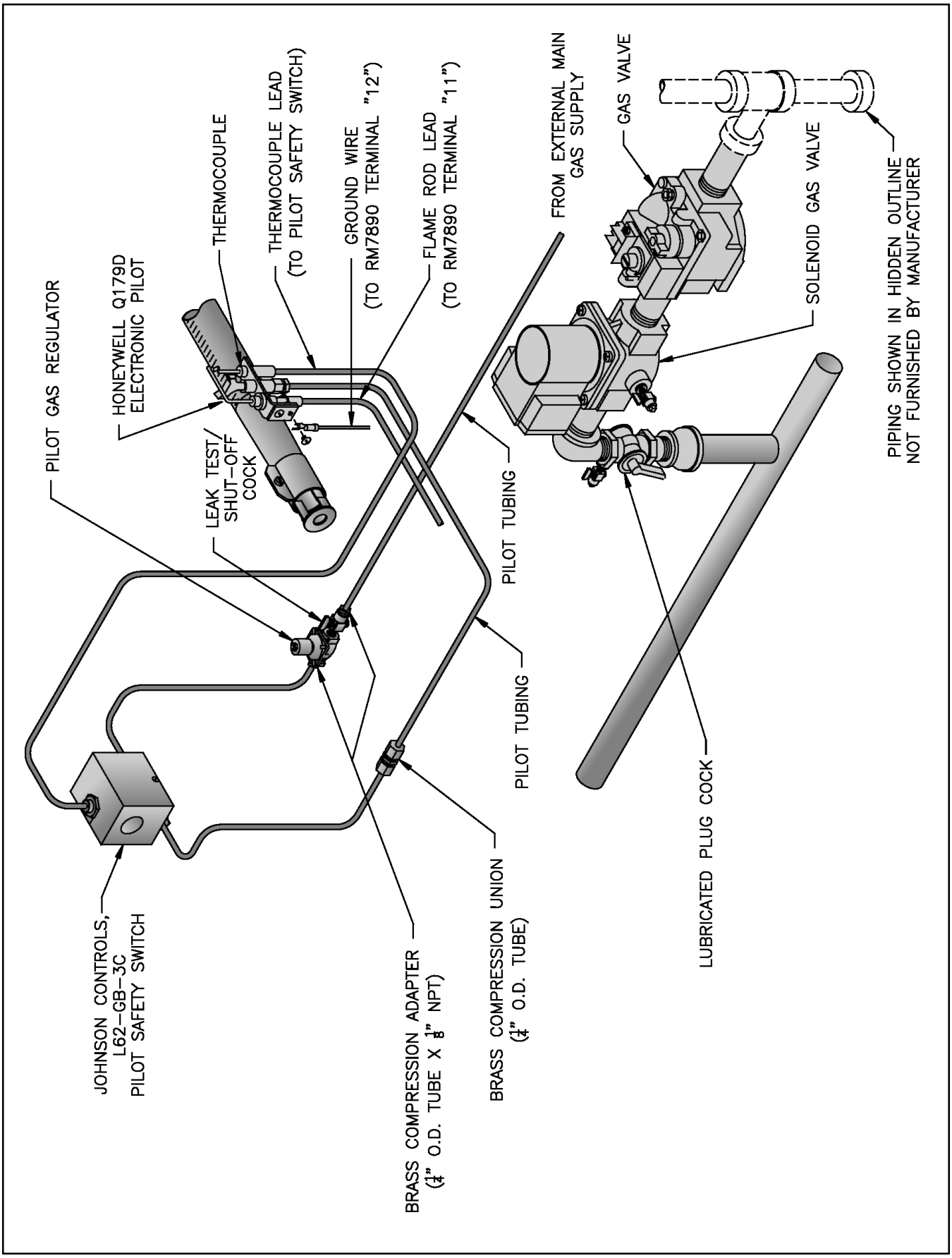


Figure 17: Schematic Gas Piping, OP-CSD-1 Control System, 808B - 810B

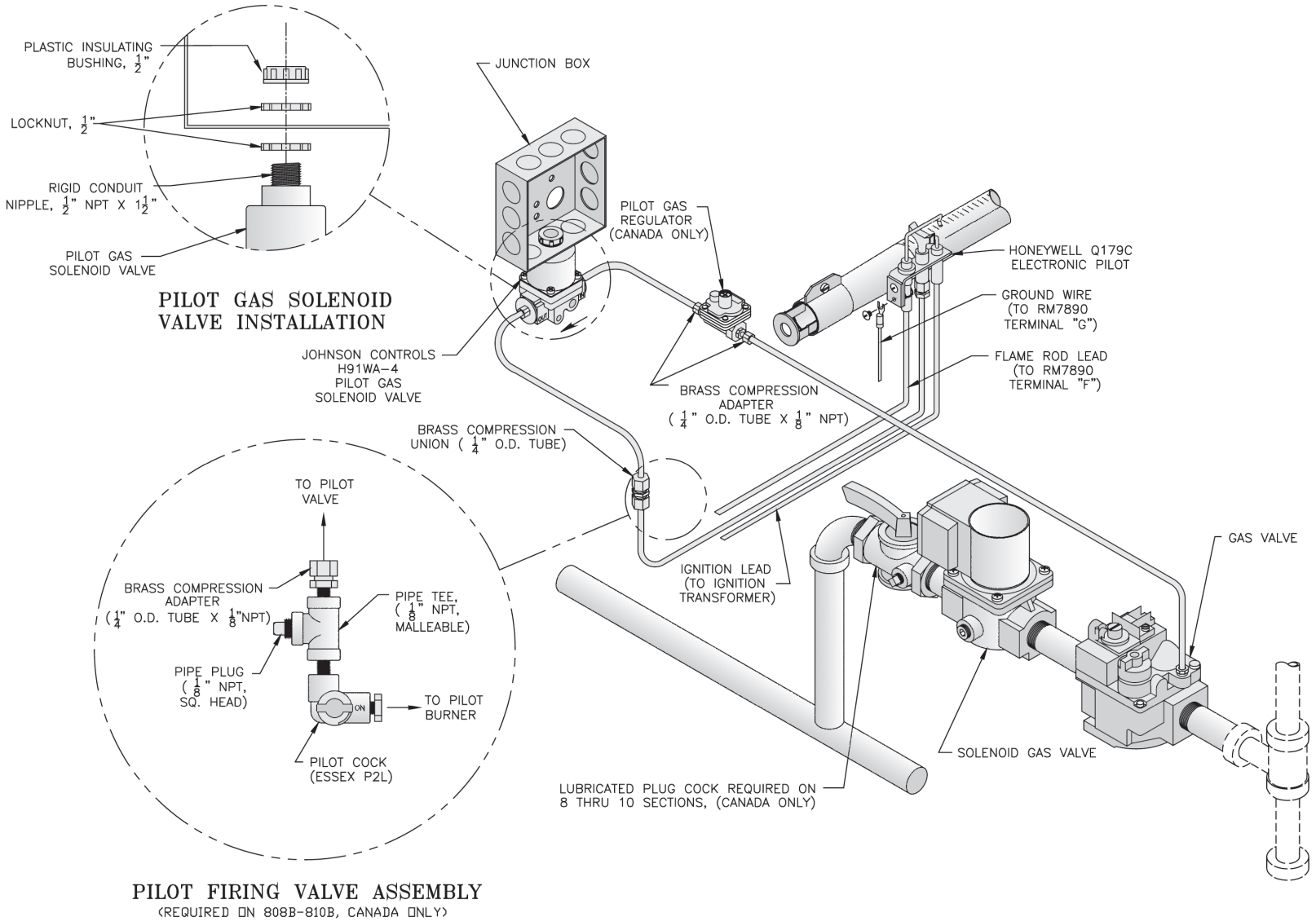

PLASTIC INSULATING BUSHING, 1/2"
LOCKNUT, 1/2"
RIGID CONDUIT NIPPLE, 1/2" NPT X 1 1/2"
PILOT GAS SOLENOID VALVE
PILOT GAS SOLENOID VALVE INSTALLATION
JUNCTION BOX
PILOT GAS REGULATOR (CANADA ONLY)
HONEYWELL Q179C ELECTRONIC PILOT
GROUND WIRE (TO RM7890 TERMINAL "G")
FLAME ROD LEAD (TO RM7890 TERMINAL "F")
JOHNSON CONTROLS H91WA-4 PILOT GAS SOLENOID VALVE
BRASS COMPRESSION ADAPTER (1/4" O.D. TUBE X 1/8" NPT)
BRASS COMPRESSION UNION (1/4" O.D. TUBE)
TO PILOT VALVE
BRASS COMPRESSION ADAPTER (1/4" O.D. TUBE X 1/8"NPT)
PIPE TEE, (1/8" NPT, MALLEABLE)
PIPE PLUG (1/8" NPT, SQ. HEAD)
ON
TO PILOT BURNER
PILOT COCK (ESSEX P2L)
IGNITION LEAD (TO IGNITION TRANSFORMER)
GAS VALVE
SOLENOID GAS VALVE
LUBRICATED PLUG COCK REQUIRED ON 8 THRU 10 SECTIONS, (CANADA ONLY)
PILOT FIRING VALVE ASSEMBLY
(REQUIRED ON 808B-810B, CANADA ONLY)

Figure 18: Schematic Gas Piping, EP Control System (Natural Gas Only), 806B - 810B

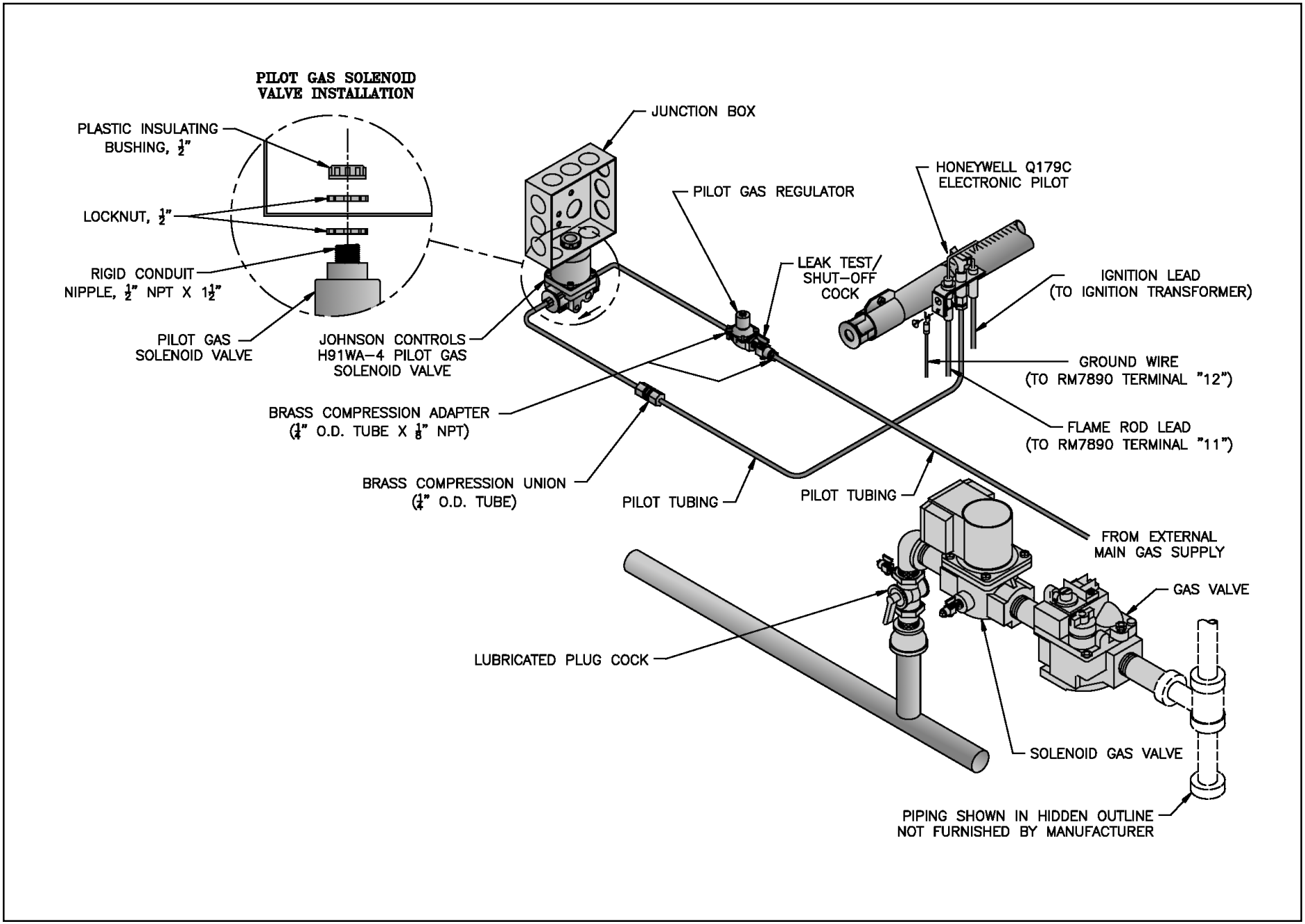

PILOT GAS SOLENOID VALVE INSTALLATION
PLASTIC INSULATING BUSHING, ½"
LOCKNUT, ½"
RIGID CONDUIT NIPPLE, ½" NPT X 1½"
PILOT GAS SOLENOID VALVE
JOHNSON CONTROLS H91WA–4 PILOT GAS SOLENOID VALVE
JUNCTION BOX
PILOT GAS REGULATOR
HONEYWELL Q179C ELECTRONIC PILOT
LEAK TEST/ SHUT–OFF COCK
IGNITION LEAD (TO IGNITION TRANSFORMER)
GROUND WIRE (TO RM7890 TERMINAL "12")
FLAME ROD LEAD (TO RM7890 TERMINAL "11")
BRASS COMPRESSION ADAPTER (¼" O.D. TUBE X ⅛" NPT)
BRASS COMPRESSION UNION (¼" O.D. TUBE)
PILOT TUBING
PILOT TUBING
FROM EXTERNAL MAIN GAS SUPPLY
GAS VALVE
LUBRICATED PLUG COCK
SOLENOID GAS VALVE
PIPING SHOWN IN HIDDEN OUTLINE NOT FURNISHED BY MANUFACTURER

Figure 19: Schematic Gas Piping, EP-CSD-1 Control System, 808B - 810B

IV. Water Trim and Piping

WARNING

Failure to properly pipe boiler may result in improper operation and damage to boiler or structure.

Oxygen contamination of boiler water will cause corrosion of iron and steel boiler components, and can lead to boiler failure. Burnham's Warranty does not cover problems caused by oxygen contamination of boiler water or scale (lime) build-up caused by frequent addition of water.

A. Design and install boiler and system piping to prevent oxygen contamination of boiler water and frequent water additions.

1. There are many possible causes of oxygen contamination such as:
   a. Addition of excessive make-up water as a result of system leaks.
   b. Absorption through open tanks and fittings.
   c. Oxygen permeable materials in the distribution system.
2. In order to insure long product life, oxygen sources must be eliminated. This can be accomplished by taking the following measures:
   a. Repairing system leaks to eliminate the need for addition of make-up water.
   b. Eliminating open tanks from the system.
   c. Eliminating and/or repairing fittings which allow oxygen absorption.
   d. Use of non-permeable materials in the distribution system.
   e. Isolating the boiler from the system water by installing a heat exchanger.
   f. Use properly designed and operating air elimination devices in water piping.

B. Design system to obtain a 20°F temperature rise through the boiler (see Table 4). If a temperature rise greater than 40°F is desired, consult Burnham.

C. Install Safety Relief Valve. See Figure 20. Components are located in Water Trim Carton. Safety Relief Valve must be installed with spindle in vertical position.

1. Install ¾" NPT x 3½" lg. nipple in tapping "C". See Figure 3.
2. Install safety relief valve on ¾" NPT nipple.

WARNING

Pressure relief valve discharge piping must be piped such that the potential of severe burns is eliminated. DO NOT pipe in any area where freezing could occur. DO NOT install any shut off valves, plugs or caps. Consult Local Codes for proper discharge piping arrangement.

Table 4: Flow Rate, Temperature Rise, and Pressure Drop

BOILER SIZE	FLOW RATE (GPM)	TEMP. RISE THRU BOILER	MIN. BOILER PIPING (NPT)	BOILER PRESSURE DROP
805B	21 14 10	20°F 30°F 40°F	1½" 1¼" 1¼"	3' 2' 1'
806B	26 17 13	20°F 30°F 40°F	1½" 1½" 1¼"	3' 2' 1'
807B	31 21 15	20°F 30°F 40°F	2" 1½" 1¼"	3' 2' 1'
808B	37 24 18	20°F 30°F 40°F	2" 1½" 1½"	3' 2' 1'
809B	42 28 21	20°F 30°F 40°F	2" 2" 1½"	3' 2' 1'
810B	47 31 23	20°F 30°F 40°F	2" 2" 1½"	3' 2' 1'

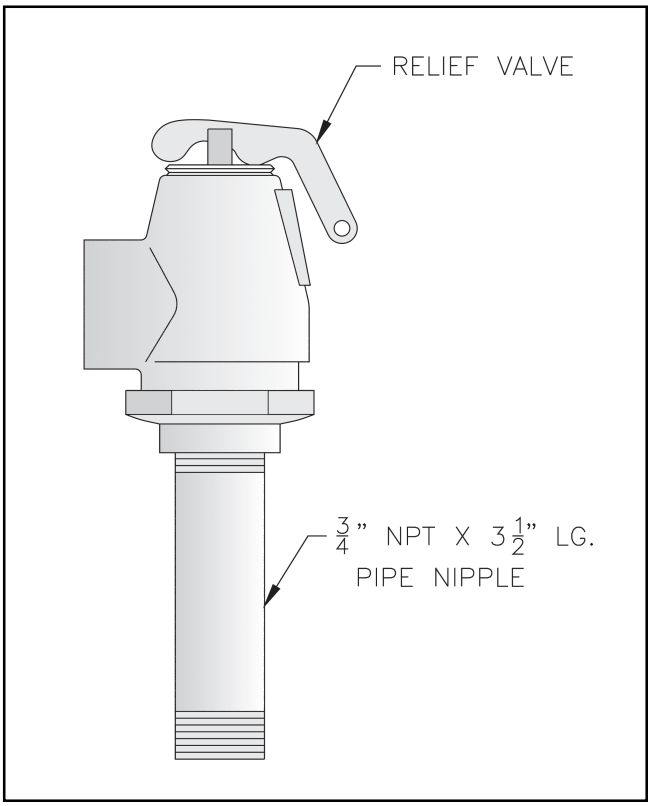


Figure 20: Safety Relief Valve Installation

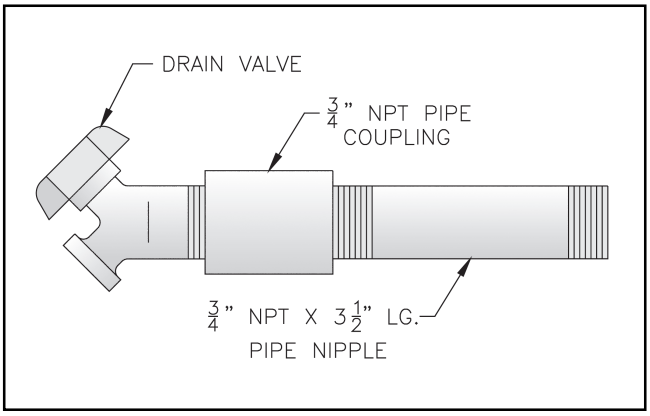


Figure 21: Drain Piping Installation

D. **Install Drain Valve** in rear of Left End Section, Tapping "G". See Figure 21. Components are located in Water Trim Carton.

E. **Install Temperature-Pressure Gauge**. Components are located in Water Trim Carton.

1. Standard Temperature - Pressure Gauge Piping. See Figure 22.
   a. Install 2" NPT x 10" lg. nipple with gauge tapping into Supply Tapping "A". See Figure 3. Gauge tapping should face forward.
   b. Insert Temperature-Pressure Gauge. Tighten by applying pressure to square shank on back of gauge. DO NOT APPLY PRESSURE ON GAUGE CASE since this may ruin gauge calibration.
2. Alternate Temperature-Pressure Gauge Piping. See Figure 23.
   a. Install 2 NPT x 10" Nipple into Supply Tapping "A". See Figure 3.
   b. Install 2 NPT x ¾ NPT x 2 NPT Tee (provided) or 2 NPT x 2 NPT x ¾ NPT Tee (installer furnished). ¾" NPT leg should face forward.
   c. Install ¾ NPT x ¼ NPT Bushing.
   d. Insert Temperature-Pressure Gauge. Tighten by applying pressure to square shank on back of gauge. DO NOT APPLY PRESSURE ON GAUGE CASE since this may ruin gauge calibration.

F. **Connect system supply and return piping** to boiler. See Figure 25. Also consult I=B=R Installation and Piping Guides. Maintain minimum ½ inch clearance from hot water piping to combustible materials.

1. If boiler is used in connection with refrigeration systems, boiler must be installed with chilled medium piped in parallel with heating boiler using appropriate valves to prevent chilled medium from entering boiler. See Figure 24. Also consult I=B=R Installation and Piping Guides.
2. If boiler is connected to heating coils located in air handling units where they may be exposed to refrigerated air, boiler piping must be equipped with flow control valves to prevent gravity circulation of boiler water during cooling system operation.
3. Use boiler bypass if boiler is operated in system which has a large volume or excessive radiation where low boiler water temperatures may be encountered (i.e. converted gravity circulation system, etc.). See Figure 25.
4. A hot water boiler installed above radiation level must be provided with a low water cutoff device as part of installation.
5. A start-up strainer is recommended for practically all modular installations (new and replacement alike) to prevent system debris and sediment from ending up in the boilers where it will inhibit heat transfer and may eventually cause a cast iron section to crack from overheating.

G. **Alliance Water Heater** (if used). Refer to Alliance Installation, Operating and Service Instructions for additional information. Install in same manner as space heating zone.

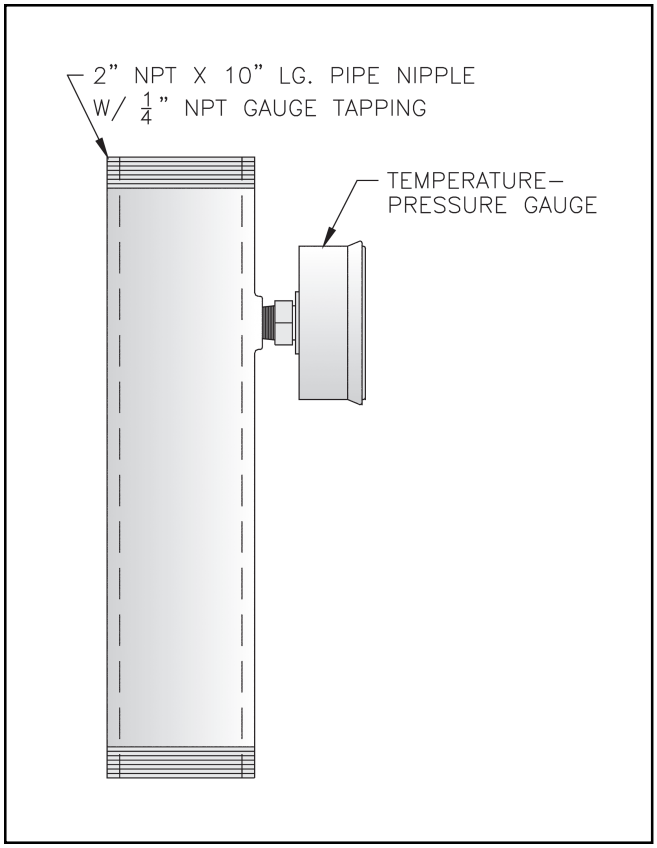


Figure 22: Temperature-Pressure Gauge Installation

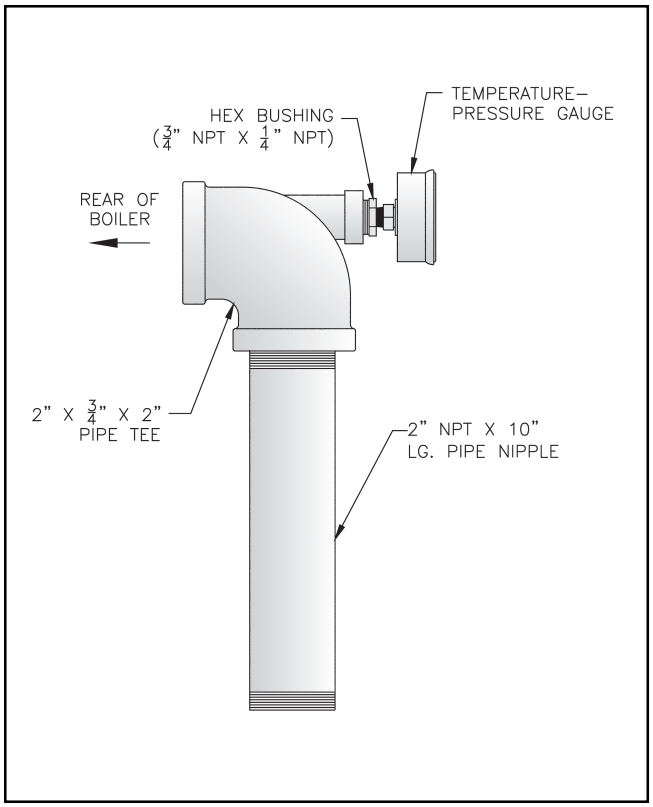


Figure 23: Alternate Temperature-Pressure Gauge Installation

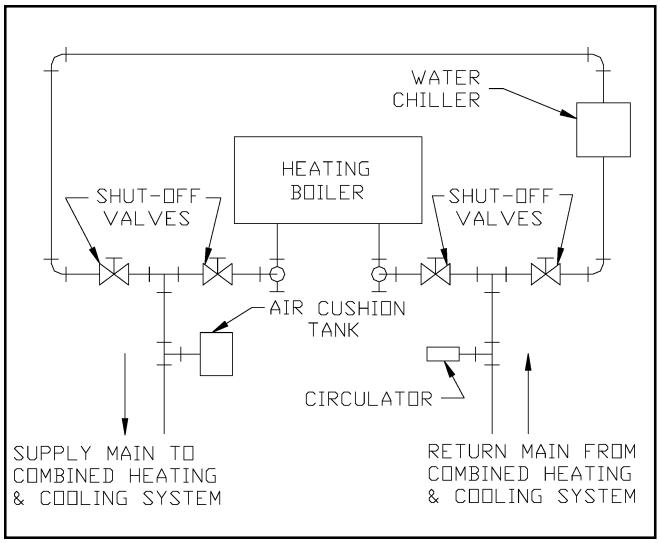


Figure 24: Recommended Piping for Combination Heating & Cooling (Refrigeration) System

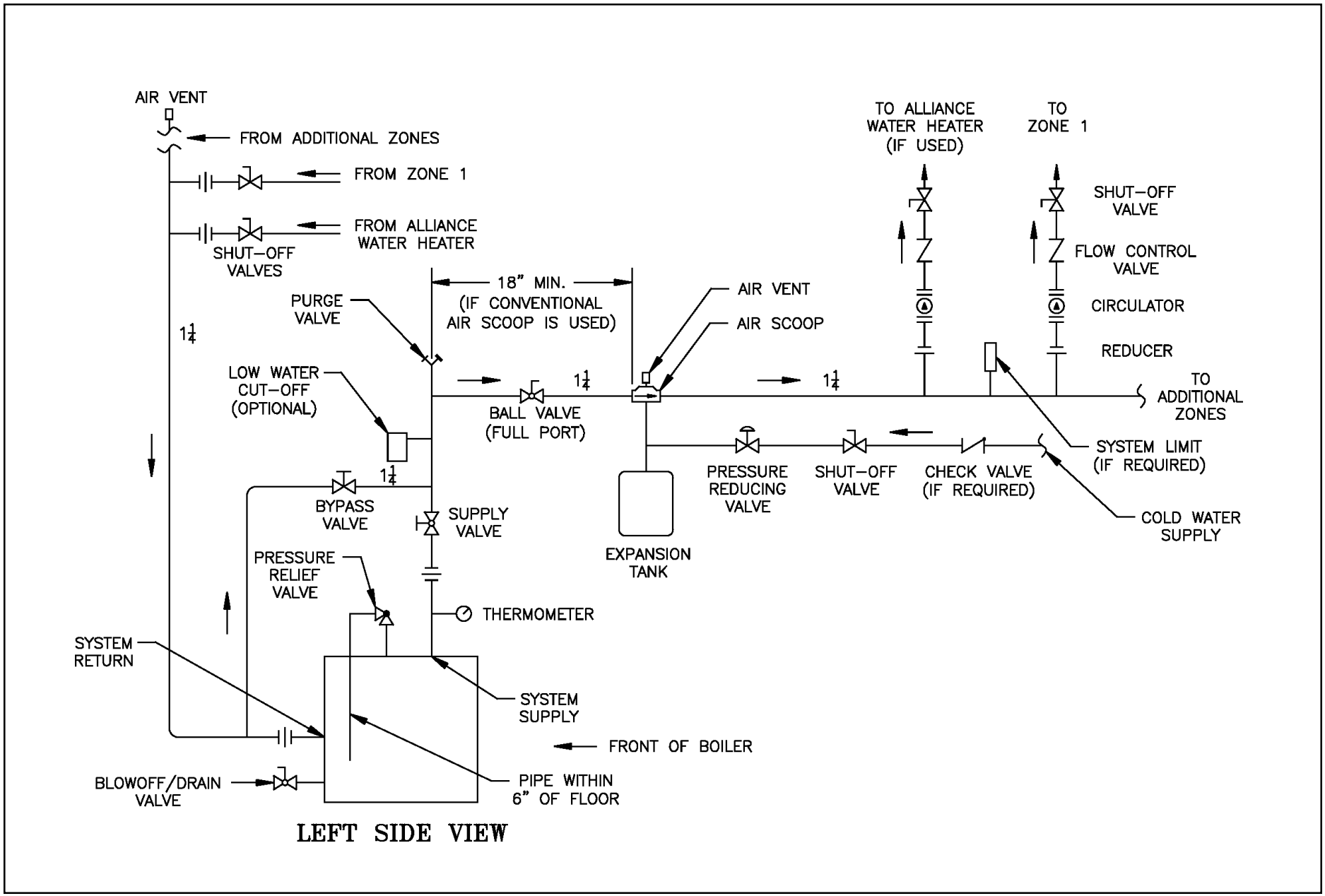


Figure 25: Recommended Boiler Piping for Circulator Zoned Heating Systems

V. Gas Piping

WARNING

Failure to properly pipe gas supply to boiler may result in improper operation and damage to the boiler or structure. Always assure gas piping is absolutely leak free and of the proper size and type for the connected load.
An additional gas pressure regulator may be needed. Consult gas supplier.

A. Size gas Piping. Design system to provide adequate gas supply to boiler. Consider these factors:

1. Allowable pressure drop from point of delivery to boiler. Maximum allowable system pressure is ½ psig. Actual point of delivery pressure may be less; contact gas supplier for additional information. Minimum allowable gas valve inlet pressure is indicated on rating label.
2. Maximum gas demand. Table 5 lists boiler input rate. Also consider existing and expected future gas utilization equipment (i.e. water heater, cooking equipment)
3. Length of piping and number of fittings. Refer to Table 6 for maximum capacity of Schedule 40 pipe. Table 7 lists equivalent length for standard fittings.

Table 5: Rated Input

Boiler Model Number	Rated Capacity [cubic feet per hour]		Gas Connection Size
	Natural	LP/Propane	
805B	264	105.5	1
806B	330	132	1
807B	396	158.5	1
808B	462	184.75	1
809B	528	211.25	1
810B	594	237.5	1

4. Specific gravity of gas. Gas piping systems for gas with a specific gravity of 0.70 or less can be sized directly from Table 6, unless authority having jurisdiction specifies a gravity factor be applied. For specific gravity greater than 0.70, apply gravity factor from Table 8. If exact specific gravity is not shown choose next higher value.

   For materials or conditions other than those listed above, refer to the *National Fuel Gas Code*, NFPA 54/ANSI Z223.1 and/or CAN/CGA B149 Installation Codes, or size system using standard engineering methods acceptable to authority having jurisdiction.

B. Connect boiler gas valve to gas supply system.

WARNING

Failure to use proper thread compounds on all gas connectors may result in leaks of flammable gas.

WARNING

Gas supply to boiler and system must be absolutely shut off prior to installing or servicing boiler gas piping.

1. Use methods and materials in accordance with local plumbing codes and requirements of gas supplier. In absence of such requirements, follow the *National Fuel Gas Code*, NFPA 54/ANSI Z223.1 and/or CAN/CGA B149 Installation Codes.
2. Use thread (joint) compound (pipe dope) resistant to action of liquefied petroleum gas.
3. Install sediment trap, ground-joint union and manual shut-off valve upstream of boiler gas valve and outside jacket. See Figure 26.
4. All above ground gas piping upstream from manual gas valve must be electrically continuous and bonded to a grounding electrode. Do not use gas piping as a grounding electrode. Refer to the *National Electrical Code*, ANSI/NFPA 70 and/or CSA C22.1 Electrical Code.

NOTICE

USA boilers built for installation at altitudes greater than 2,000 feet above sea level have been specially orificed to reduce gas input rate 4 percent per 1,000 feet above sea level per the National Fuel Gas Code, NFPA 54/ANSI Z223.1, Section 8.1.2 and Appendix F. Canadian boilers' orifice sizing is indicated on the rating label. High altitude boiler models are identifiable by the model number's ninth digit on the rating label. (4=2000' - 4500', 5= 2000' - 5000')

Table 6: Maximum Capacity of Schedule 40 Pipe in CFH for Gas Pressures of 0.5 psig or Less

Length [Feet]	0.3 inch w.c. Pressure Drop				0.5 inch w.c. Pressure Drop			
	½	¾	1	1¼	½	¾	1	1¼
10	132	278	520	1,050	175	360	680	1,400
20	92	190	350	730	120	250	465	950
30	73	152	285	590	97	200	375	770
40	63	130	245	500	82	170	320	660
50	56	115	215	440	73	151	285	580
60	50	105	195	400	66	138	260	530
70	46	96	180	370	61	125	240	490
80	43	90	170	350	57	118	220	460
90	40	84	160	320	53	110	205	430
100	38	79	150	305	50	103	195	400

Table 7: Equivalent Lengths of Standard Pipe Fittings & Valves

		Valves (Fully Open)				Threaded Fittings			
Pipe Size	I. D. Inches	Gate	Globe	Angle	Swing Check	90° Elbow	45° Elbow	90° Tee, Flow Through Run	90° Tee, Flow Through Branch
½"	0.622	0.35	18.6	9.3	4.3	1.6	0.78	1.0	3.1
¾"	0.824	0.44	23.1	11.5	5.3	2.1	0.97	1.4	4.1
1"	1.049	0.56	29.4	14.7	6.8	2.6	1.23	1.8	5.3
1¼"	1.380	0.74	38.6	19.3	8.9	3.5	1.6	2.3	6.9

Table 8: Specific Gravity Correction Factors

Specific Gravity	Correction Factor	Specific Gravity	Correction Factor
0.50	1.10	1.30	1.07
0.55	1.04	1.40	1.04
0.60	1.00	1.50	1.00
0.65	0.96	1.60	0.97
0.70	0.93	1.70	0.94
0.75	0.90		
0.80	0.87		

C. Pressure Test. The boiler and its gas connection must be leak tested before placing boiler in operation.

1. Protect boiler gas valve. For all testing over ½ psig, boiler and its individual shut-off valve must be disconnected from gas supply piping. For testing at ½ psig or less, isolate boiler from gas supply piping by closing boiler's individual manual shut-off valve.
2. Locate leaks using approved combustible gas detector, soap and water, or similar nonflammable solution.

WARNING

Do not use matches, candles, open flames, or other ignition source.

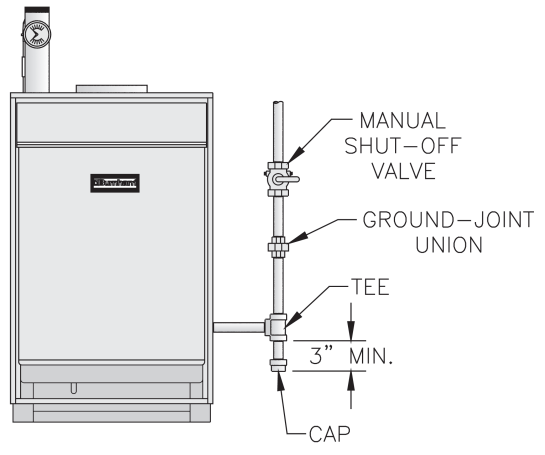


Figure 26: Recommended Gas Piping

VI. Venting

A. **Install vent system** in accordance with local building codes; or local authority having jurisdiction; or *National Fuel Gas Code*, ANSI Z223.1/NFPA 54, Part 7, Venting of Equipment and/or CAN/CGA B149 Installation Codes, Part 5, Venting Systems and Air Supply for Appliances. Install any of the following for this Series 8B Category I, draft hood equipped appliance:

1. Type B or Type L gas vent. Install in accordance with listing and manufacturer's instructions.
2. Masonry or metal chimney. Build and install in accordance with local building codes; or local authority having jurisdiction; or *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances*, ANSI/NFPA 211 and/or *National Building Code of Canada*.

   Masonry chimney must be lined with approved clay flue lining or listed chimney lining system except as provided in ANSI Z223.1/NFPA 54, Paragraph 7.5.4(a): *Exception: Where permitted by the authority having jurisdiction, existing chimneys shall be permitted to have their use continued when an appliance is replaced by an appliance of similar type, input rating, and efficiency.*
3. Single wall metal vent. Allowed by ANSI Z223.1/ NFPA 54 under very restrictive conditions.

B. **Inspect chimney** and remove any obstructions or restrictions. Clean chimney if previously used for solid or liquid fuel-burning appliances or fireplaces.

DANGER

Inspect existing chimney before installing boiler. Failure to clean or replace perforated pipe or tile lining will cause severe injury or death.

C. **Install Draft Hood** on canopy outlet. Maintain height from Jacket Top Panel to Draft Hood skirt as shown in Figure 1. DO NOT ALTER, CUT, OR MODIFY DRAFT HOOD.

WARNING

Do not alter boiler draft hood or place any obstruction or non-approved damper in the breeching or vent system. Flue gas spillage can occur. Unsafe boiler operation will occur.

D. **Install Blocked Vent Switch.** The Blocked Vent Switch Assembly consists of a strain relief bushing, power cord, and switch attached to mounting bracket. On Packaged boilers, the assembly is shipped attached to top of boiler. On Knocked Down boilers, the assembly is located in Combination Boiler Parts and Control Carton.

1. Uncoil power cord.
2. Position mounting bracket onto lower edge of Draft Hood skirt. Locate center tooth (with #10 sheet metal screw) on outside and other two teeth inside Draft Hood skirt. See Figure 27.
3. Slide mounting bracket tight against lower edge of Draft Hood skirt. Position #10 sheet metal screw above skirt's stiffening rib.
4. Secure bracket in position by tightening #10 sheet metal screw against outer surface of Draft Hood skirt.
5. Insert excess power cord through Jacket Right Side Panel hole. Remove slack.
6. Position strain relief bushing around power cord. Pinch bushing's two halves together and snap back into hole in Jacket Right Side Panel.
7. Verify power cord, mounting bracket, and Blocked Vent Switch are secure and located as shown in Figure 27.

WARNING

Do not operate boiler without Blocked Vent Switch properly installed.

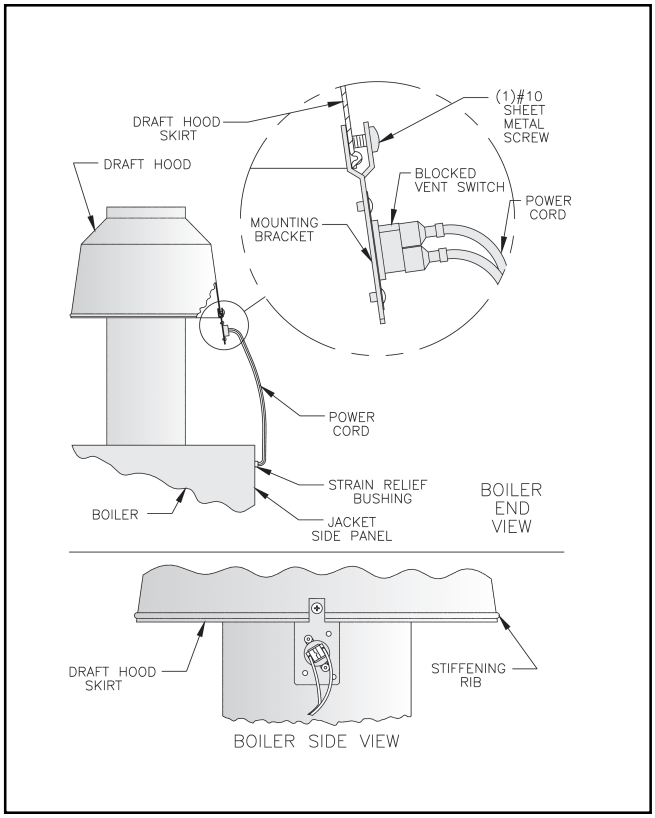


Figure 27: Blocked Vent Switch Installation

E. Boiler Equipped With Vent Damper. See Figure 28.

1. Open Vent Damper Carton and remove Installation Instructions. Read Installation Instructions thoroughly before proceeding.

CAUTION

Do not use one vent damper to control two or more heating appliances.

2. Vent damper must be same size as draft hood outlet. See Figure 1. Unpack vent damper carefully. Forcing vent damper open or closed may damage gear train and void warranty. Vent damper assembly includes pre-wired connection harness with polarized plug.
3. Mount vent damper assembly on draft hood without modification to either (Refer to instructions packed with vent damper for specific instructions). Vent damper position indicator to be visible to users.

CAUTION

Provide adequate clearance for servicing - provide 6" minimum clearance between damper and combustible construction.

F. Install Vent Connector from draft hood or vent damper to chimney. See Figure 29. For modular or multiple boiler installations, review *"Multiple-Modular Manual for Series 8B Gas Boilers*", P/N 8141615.

1. Do not connect into same leg of chimney serving an open fireplace.
2. Where two or more appliances vent into a common vent, the area of the common vent should at least equal the area of the largest vent plus 50 % of the area of the additional vents. Do not connect the vent of this appliance into any portion of mechanical draft system operating under positive pressure.
3. Vent connector should have the greatest possible initial rise above the draft hood consistent with the head room available and the required clearance from adjacent combustible building structure.
4. Install vent connector above bottom of chimney to prevent blockage - inspect chimney for obstructions or restrictions and remove - clean chimney if necessary.
5. Vent connector should slope upward from draft hood to chimney not less than one inch in four feet. No portion of vent connector should run downward or have dips or sags. Vent connector must be securely supported.
6. Use thimble where vent connector enters masonry chimney - keep vent connector flush with inside of flue liner.
7. Do not install Non-listed (AGA, CGA, CSA, ETL, or UL) vent damper or other obstruction in vent pipe.
8. Locate Boiler as close to Chimney as possible consistent with necessary clearances. See Section I: Pre-Installation.

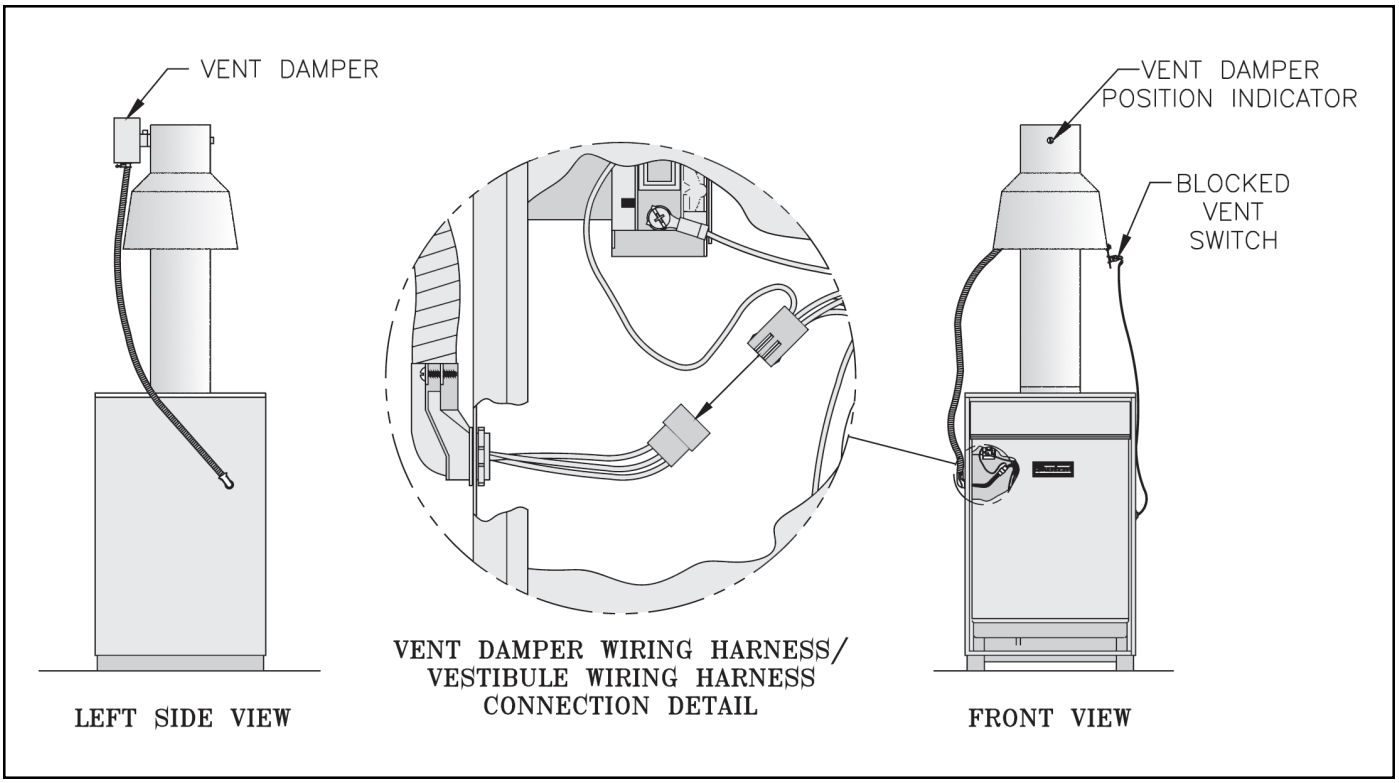


Figure 28: Vent Damper Installation

9. Design vent system for sea level input.
10. Provide adequate ventilation of Boiler Room. See Section I: Pre-Installation.
11. Never pass any portion of vent system through a circulating air duct or plenum.

G. If an Existing Boiler is Removed:

At the time of removal of an existing boiler, the following steps shall be followed with each appliance remaining connected to the common venting system

WARNING

When an existing boiler is removed from a common venting system, the common venting system is likely to be too large for proper venting of the appliances remaining connected to it.

placed in operation, while the other appliances remaining connected to the common venting system are not in operation:

1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion, or other deficiencies which could cause an unsafe condition.
3. Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range-hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
4. Place in operation the appliance being inspected. Follow the Lighting (or Operating) Instructions. Adjust thermostat so appliance will operate continuously.
5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.
6. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous condition of use.
7. Any improper operation of the common venting system should be corrected so the installation conforms with the *National Fuel Gas Code*, NFPA 54/ANSI Z223.1. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Part 7 and Part 11 in the *National Fuel Gas Code*, NFPA 54/ANSI Z223.1.

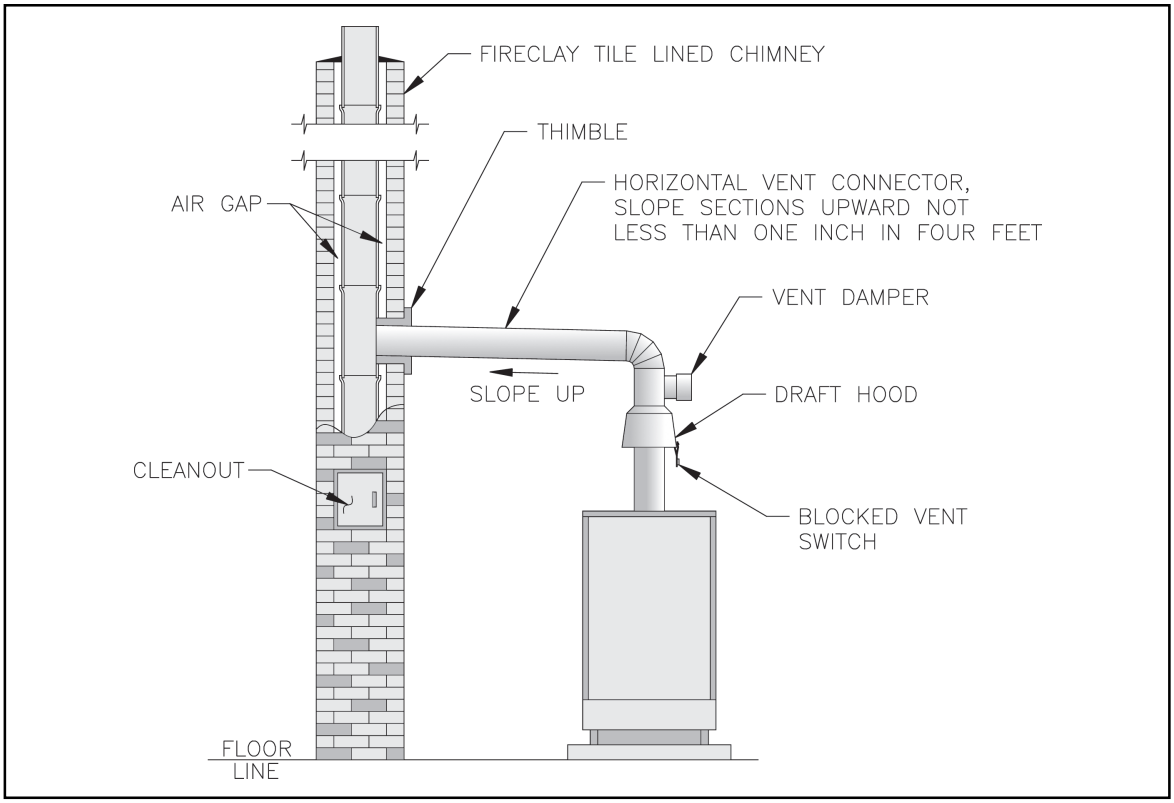


Figure 29: Typical Vent System

VII. Electrical

DANGER

Positively assure all electrical connections are unpowered before attempting installation or service of electrical components or connections of the boiler or building. Lock out all electrical boxes with padlock once power is turned off.

WARNING

Failure to properly wire electrical connections to the boiler may result in serious physical harm.

Electrical power may be from more than one source. Make sure all power is off before attempting any electrical work.

Each boiler must be protected with a properly sized fused disconnect.

Never jump out or make inoperative any safety or operating controls.

The wiring diagrams contained in this manual are for reference purposes only. Each boiler is shipped with a wiring diagram attached to the front door. Refer to this diagram and the wiring diagram of any controls used with the boiler. Read, understand and follow all wiring instructions supplied with the controls.

A. Install Boiler Wiring

1. Knockdown boilers only. Locate wiring harnesses in Combination Boiler Parts and Control Carton. Refer to Table 10 and connect wiring as shown on the appropriate wiring diagram.
2. Connect supply wiring and electrically ground boiler in accordance with requirements of authority having jurisdiction, or in absence of such requirements the *National Electrical Code*, ANSI/NFPA 70 and/or CSA C22.1 Electrical Code.

B. Wire Vent Damper (if used; required on 805, optional on 806-810). See Figure 28.

1. Attach Vent Damper Harness to mounting hole in Jacket Left Side Panel. Install Cable Clamp around flexible conduit and attach to Jacket Top Panel.
2. Remove factory installed Jumper Plug from Vent Damper Receptacle on Vestibule Wiring Harness and discard.
3. Plug Vent Damper Harness Plug into Vent Damper Receptacle. See Figure 28.

C. Install thermostat. Locate on inside wall approximately 4 feet above floor. Do not install on outside wall, near fireplace, or where influenced by drafts or restricted air flow, hot or cold pipes, lighting fixtures, television, or sunlight. Allow free air movement by avoiding placement of furniture near thermostat.
Set heat anticipator to match control system requirements. Refer to Table 9.

D. Wire thermostat. Provide Class II circuit between thermostat and boiler. Refer to appropriate wiring diagram for control system being used.

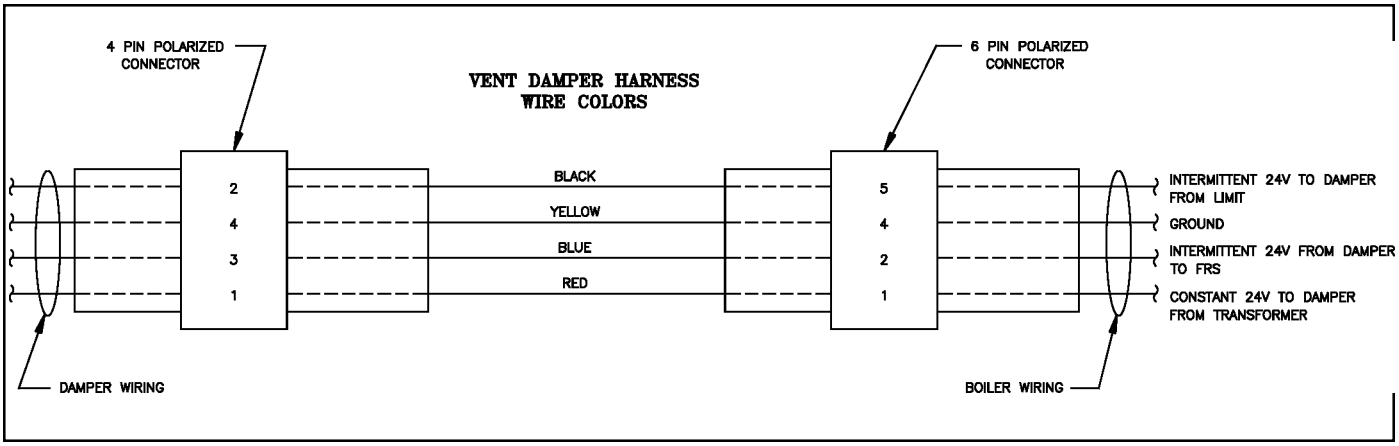


Figure 30: Vent Damper Schematic Wiring Diagram

E. **Alliance Water Heater** (if used). May be used with Intermittent Circulation only.

Refer to *Alliance Installation, Operating and Service Instructions* for wiring, piping and additional information.

F. **Vent Damper Sequence of Operation.** See Figure 30 for schematic wiring diagram.

1. The Vent Damper is continuously powered at Terminal 1.
2. When there is a call for heat, the damper relay coil is energized through Terminal 5 if all limits ahead of the damper are satisfied.
3. The relay coil closes contacts which energize the damper motor, causing the damper to open.
4. When the damper blade reaches the fully open position, power is sent back to the ignition circuit through Terminal 2 and the damper motor is de-energized.
5. When the call for heat is satisfied, the damper relay coil is de-energized - closing contacts which energize the damper motor. This causes the damper to close. When the damper blade reaches the fully closed position, the damper motor is de-energized.

POWER FAILURE - The damper blade will stop in the position it was in when power failed. (Combustion can never take place unless the damper blade is in the fully open position.)

G. **Sequence of Operation and Wiring.** Refer to Table 10 for the appropriate control system.

H. **Optional Low-Water Cut-Off Wiring.** See Figures 45 through 48.

Table 9: Heat Anticipator Settings

Control System	Heat Anticipator Setting *	
	Continuous Circulation	Intermittent Circulation
24V Standing Pilot	1.1	0.3
24V Electronic Ignition (EI)	USA: 0.9	0.3
	Canada: 1.2	

* If room is heated above thermostat temperature setting, reduce heat anticipator setting by 0.1 or 0.2 amps. If boiler short cylces without room reaching desired temperature, increase heat anticipator setting by 0.1 or 0.2 amps.

Table 10: Sequence of Operation and Wiring Diagrams

Ignition System	Country	Fuel	Boiler Sizes	Wiring Diagram Figure		Sequence of Operation
				Continuous	Intermittent	
Standing Pilot (24V)	USA & Canada	Natural Gas	6 & 7 Sect.	Figure 31	Figure 32	Page 38
		LP Gas				
Standing Pilot (OP--120V)	USA & Canada	Natural Gas	6 - 10 Sect.	Figure 33	Figure 34	Page 41
		LP Gas				
Standing Pilot (OP-CSD-1--120V)	USA	LP Gas	8 - 10 Sect.	Figure 33	Figure 34	Page 41
Intermittent Ignition (Honeywell EI--24V)	USA	Natural Gas	5 - 10 Sect.	Figure 35	Figure 36	Page 44
		LP Gas				
	Canada	Natural Gas	5 - 10 Sect.	Figure 37	Figure 38	
		LP Gas	5 - 7 Sect.			
Intermittent Ignition (Johnson EI--24V)	USA	Natural Gas	5 - 10 Sect.	Figure 39	Figure 40	Page 49
		LP Gas				
	Canada	Natural Gas	5 - 10 Sect.	Figure 41	Figure 42	
		LP Gas	5 - 7 Sect.			
Intermittent Ignition (EP--120V)	USA & Canada	Natural Gas	6 - 10 Sect.	Figure 43	Figure 44	Page 54
		LP Gas	Not Available			
Intermittent Ignition (EP-CSD-1--120V)	USA	Natural Gas	8 - 10 Sect.	Figure 43	Figure 44	Page 54

1. Standing Pilot (24) Sequence of Operation
   a. Normal Operation
      i. Thermostat or operating control calls for heat. Vent Damper (if used) opens.
      ii. Gas valves are energized allowing main gas flow and ignition of main burners.
      iii. Call or heat ends. Gas valves are de-energized, extinguishing main flame. Vent Damper (if used) closes.
   b. Safety Shutdown
      i. Limit: Automatically interrupts main burner operation when water temperature exceeds set point. Maximum allowable temperature is 250°F. Circulator continues to operate with call for heat, Vent Damper (if used) closes. Normal operation resumes when water temperature falls below set point.
      ii. Blocked Vent Switch: Automatically interrupts main burner operation when excessive flue gas spillage occurs. Circulator continues to operate and Vent Damper (if used) remains open with call for heat. If blocked vent switch is activated do not attempt to place boiler in operation. Correct cause of spillage and reset blocked vent switch.
      iii. Flame Roll-out Switch: Automatically interrupts main burner operation when flames or excessive heat are present in vestibule. Circulator continues to operate and Vent Damper (if used) remains open with call for heat. Control is single use device. If flame roll-out switch is activated, do not attempt to place boiler in operation. Correct cause of spillage and replace flame roll-out switch.
      iv. Thermocouple: Senses pilot flame and causes gas valves to turn off main burner and pilot burner gas flow should pilot burner flame extinguish. Circulator continues to operate and Vent Damper (if used) remains open with call for heat.

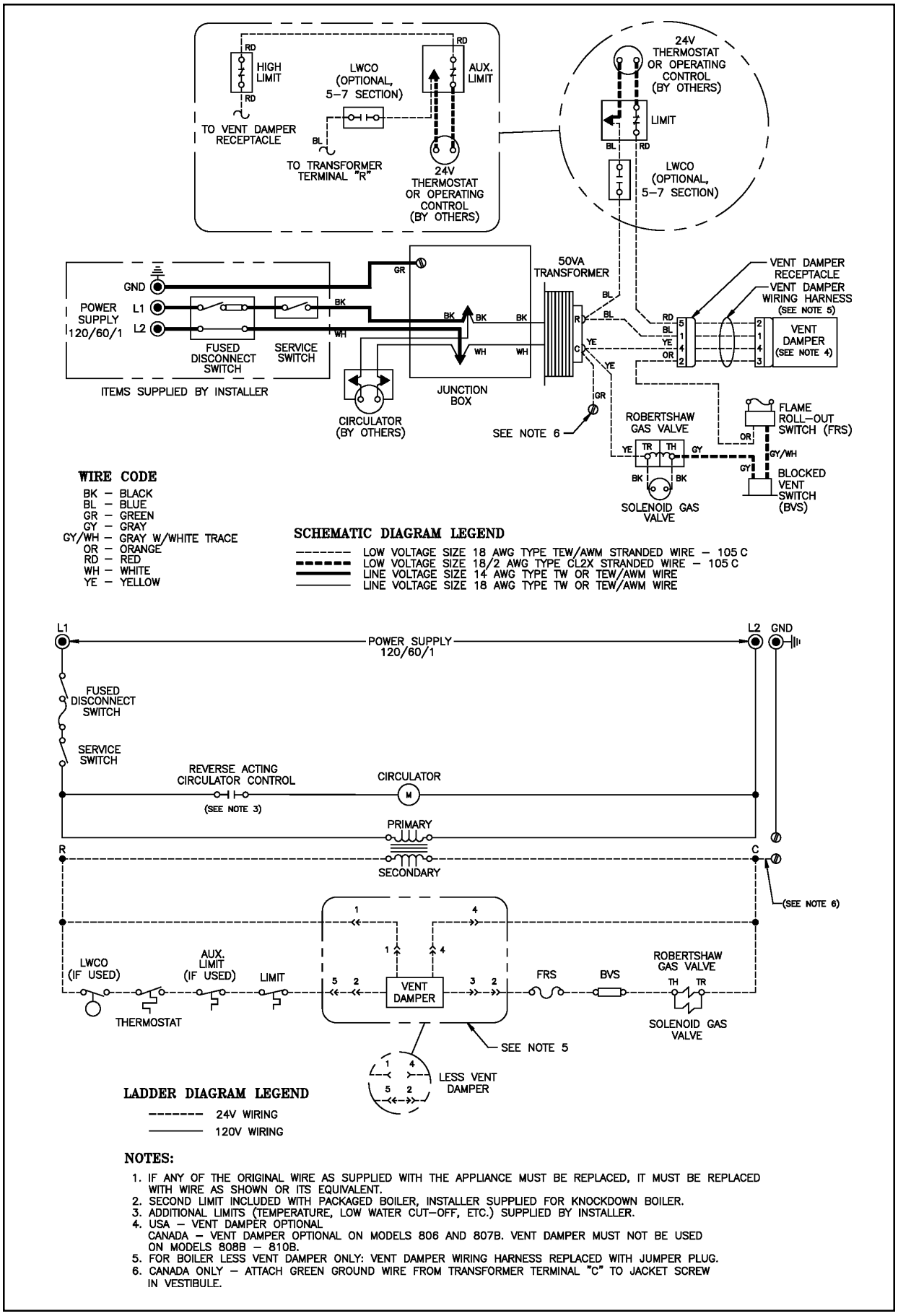
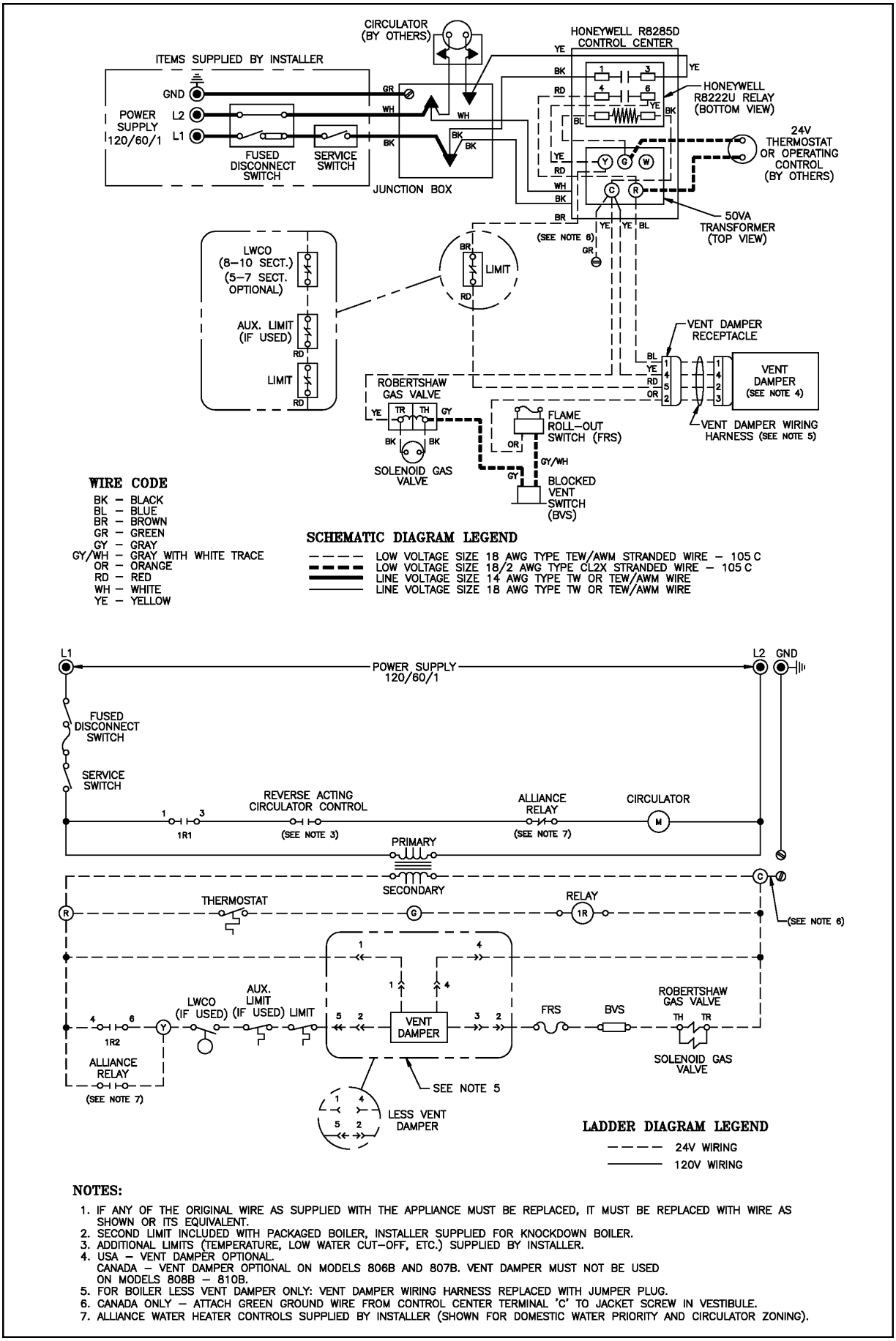

HIGH LIMIT
RD
TO VENT DAMPER RECEPTACLE
LWCO (OPTIONAL, 5-7 SECTION)
AUX. LIMIT
BL
TO TRANSFORMER TERMINAL "R"
24V THERMOSTAT OR OPERATING CONTROL (BY OTHERS)
24V THERMOSTAT OR OPERATING CONTROL (BY OTHERS)
LIMIT
LWCO (OPTIONAL, 5-7 SECTION)
GND
POWER SUPPLY 120/60/1
L1
L2
FUSED DISCONNECT SWITCH
SERVICE SWITCH
ITEMS SUPPLIED BY INSTALLER
CIRCULATOR (BY OTHERS)
JUNCTION BOX
50VA TRANSFORMER
SEE NOTE 6
VENT DAMPER RECEPTACLE
VENT DAMPER WIRING HARNESS (SEE NOTE 5)
VENT DAMPER (SEE NOTE 4)
ROBERTSHAW GAS VALVE
SOLENOID GAS VALVE
FLAME ROLL-OUT SWITCH (FRS)
BLOCKED VENT SWITCH (BVS)
WIRE CODE
BK - BLACK
BL - BLUE
GR - GREEN
GY - GRAY
GY/WH - GRAY W/WHITE TRACE
OR - ORANGE
RD - RED
WH - WHITE
YE - YELLOW
SCHEMATIC DIAGRAM LEGEND
LOW VOLTAGE SIZE 18 AWG TYPE TEW/AWM STRANDED WIRE - 105 C
LOW VOLTAGE SIZE 18/2 AWG TYPE CL2X STRANDED WIRE - 105 C
LINE VOLTAGE SIZE 14 AWG TYPE TW OR TEW/AWM WIRE
LINE VOLTAGE SIZE 18 AWG TYPE TW OR TEW/AWM WIRE
L1
POWER SUPPLY 120/60/1
L2
GND
FUSED DISCONNECT SWITCH
SERVICE SWITCH
REVERSE ACTING CIRCULATOR CONTROL
(SEE NOTE 3)
CIRCULATOR
PRIMARY
SECONDARY
R
C
(SEE NOTE 6)
LWCO (IF USED)
AUX. LIMIT (IF USED)
LIMIT
THERMOSTAT
VENT DAMPER
FRS
BVS
ROBERTSHAW GAS VALVE
SOLENOID GAS VALVE
SEE NOTE 5
LESS VENT DAMPER
LADDER DIAGRAM LEGEND
24V WIRING
120V WIRING
NOTES:
1. IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRE AS SHOWN OR ITS EQUIVALENT.
2. SECOND LIMIT INCLUDED WITH PACKAGED BOILER, INSTALLER SUPPLIED FOR KNOCKDOWN BOILER.
3. ADDITIONAL LIMITS (TEMPERATURE, LOW WATER CUT-OFF, ETC.) SUPPLIED BY INSTALLER.
4. USA - VENT DAMPER OPTIONAL
CANADA - VENT DAMPER OPTIONAL ON MODELS 806 AND 807B. VENT DAMPER MUST NOT BE USED ON MODELS 808B - 810B.
5. FOR BOILER LESS VENT DAMPER ONLY: VENT DAMPER WIRING HARNESS REPLACED WITH JUMPER PLUG.
6. CANADA ONLY - ATTACH GREEN GROUND WIRE FROM TRANSFORMER TERMINAL "C" TO JACKET SCREW IN VESTIBULE.

Figure 31: Wiring Diagram, Standing Pilot (24), USA and Canada, Continuous Circulation



NOTES:

1. IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRE AS SHOWN OR ITS EQUIVALENT.
2. SECOND LIMIT INCLUDED WITH PACKAGED BOILER, INSTALLER SUPPLIED FOR KNOCKDOWN BOILER.
3. ADDITIONAL LIMITS (TEMPERATURE, LOW WATER CUT–OFF, ETC.) SUPPLIED BY INSTALLER.
4. USA – VENT DAMPER OPTIONAL.
   CANADA – VENT DAMPER OPTIONAL ON MODELS 806B AND 807B. VENT DAMPER MUST NOT BE USED ON MODELS 808B – 810B.
5. FOR BOILER LESS VENT DAMPER ONLY: VENT DAMPER WIRING HARNESS REPLACED WITH JUMPER PLUG.
6. CANADA ONLY – ATTACH GREEN GROUND WIRE FROM CONTROL CENTER TERMINAL 'C' TO JACKET SCREW IN VESTIBULE.
7. ALLIANCE WATER HEATER CONTROLS SUPPLIED BY INSTALLER (SHOWN FOR DOMESTIC WATER PRIORITY AND CIRCULATOR ZONING).

Figure 32: Wiring Diagram, Standing Pilot (24V), USA and Canada, Intermittent Circulation

2. Electronically Supervised Standing Pilot (OP) Sequence of Operation
   a. Normal Operation
      i. Thermostat or operating control calls for heat.
      ii. Terminal #6 of RM7890C Burner Control is energized, initiating a microcomputer monitored circuit test.
      iii. Pilot Flame Establishing Period (PFEP) begins.
      iv. After pilot flame is proven, terminal #9 of RM7890C is energized, allowing main gas flow and ignition of main burners. "Main" gas light will be illuminated.
      v. Call for heat ends. Terminal #6 of RM7890C is de-energized, in turn de-energizing gas valves and extinguishing main flame. "Main" gas light is de-energized.
   b. Safety Shutdown
      i. Limit: Automatically interrupts main burner operation when water temperature exceeds set point. Maximum allowable temperature is 250°F. Circulator continues to operate with call for heat. Normal operation resumes when water temperature falls below set point.
      ii. Blocked Vent Switch: Automatically interrupts main burner operation when excessive flue gas spillage occurs. Circulator continues to operate with call for heat. If blocked vent switch is activated do not attempt to place boiler in operation. Correct cause of spillage and reset blocked vent switch.
      iii. Flame Roll-out Switch: Automatically interrupts main burner operation when flames or excessive heat are present in vestibule. Circulator continues to operate with call for heat. Control is single use device. If flame roll-out switch is activated, do not attempt to place boiler in operation. Correct cause of spillage and replace flame roll-out switch.
      iv. RM7890C Burner Control: Automatically interrupts main burner operation if a pilot flame is not detected during the four or ten second pilot flame establishing period. The RM7890C will lockout or recycle based on jumper settings. "Alarm" light will be illuminated. Refer to instructions supplied with RM7890C for additional control information.

3. Electronically Supervised Standing Pilot (OP-CSD-1) Sequence of Operation
   a. Normal Operation
      i. Thermostat or operating control calls for heat.
      ii. Terminal #6 of RM7890C Burner Control is energized, initiating a microcomputer monitored circuit test.
      iii. Pilot Flame Establishing Period (PFEP) begins.
      iv. After pilot flame is proven, terminal #9 of RM7890C is energized, allowing main gas flow and ignition of main burners. "Main" gas light will be illuminated.
      v. Call for heat ends. Terminal #6 of RM7890C is de-energized, in turn de-energizing gas valves and extinguishing main flame. "Main" gas light is de-energized.
   b. Safety Shutdown
      i. Limit: Automatically interrupts main burner operation when water temperature exceeds set point. Maximum allowable temperature is 250°F. Circulator continues to operate with call for heat. Normal operation resumes when water temperature falls below set point.
      ii. Blocked Vent Switch: Automatically interrupts main burner operation when excessive flue gas spillage occurs. Circulator continues to operate with call for heat. If blocked vent switch is activated do not attempt to place boiler in operation. Correct cause of spillage and reset blocked vent switch.
      iii. Flame Roll-out Switch: Automatically interrupts main burner operation when flames or excessive heat are present in vestibule. Circulator continues to operate with call for heat. Control is single use device. If flame roll-out switch is activated, do not attempt to place boiler in operation. Correct cause of spillage and replace flame roll-out switch.
      iv. RM7890C Burner Control: Automatically interrupts main burner operation if a pilot flame is not detected during the four or ten second pilot flame establishing period. The RM7890C will lockout or recycle based on jumper settings. "Alarm" light will be illuminated. Refer to instructions supplied with RM7890C for additional control information.
      v. Pilot Safety Switch: Automatically de-energizes main gas valve and interrupts pilot gas supply if pilot flame is not detected at any time.

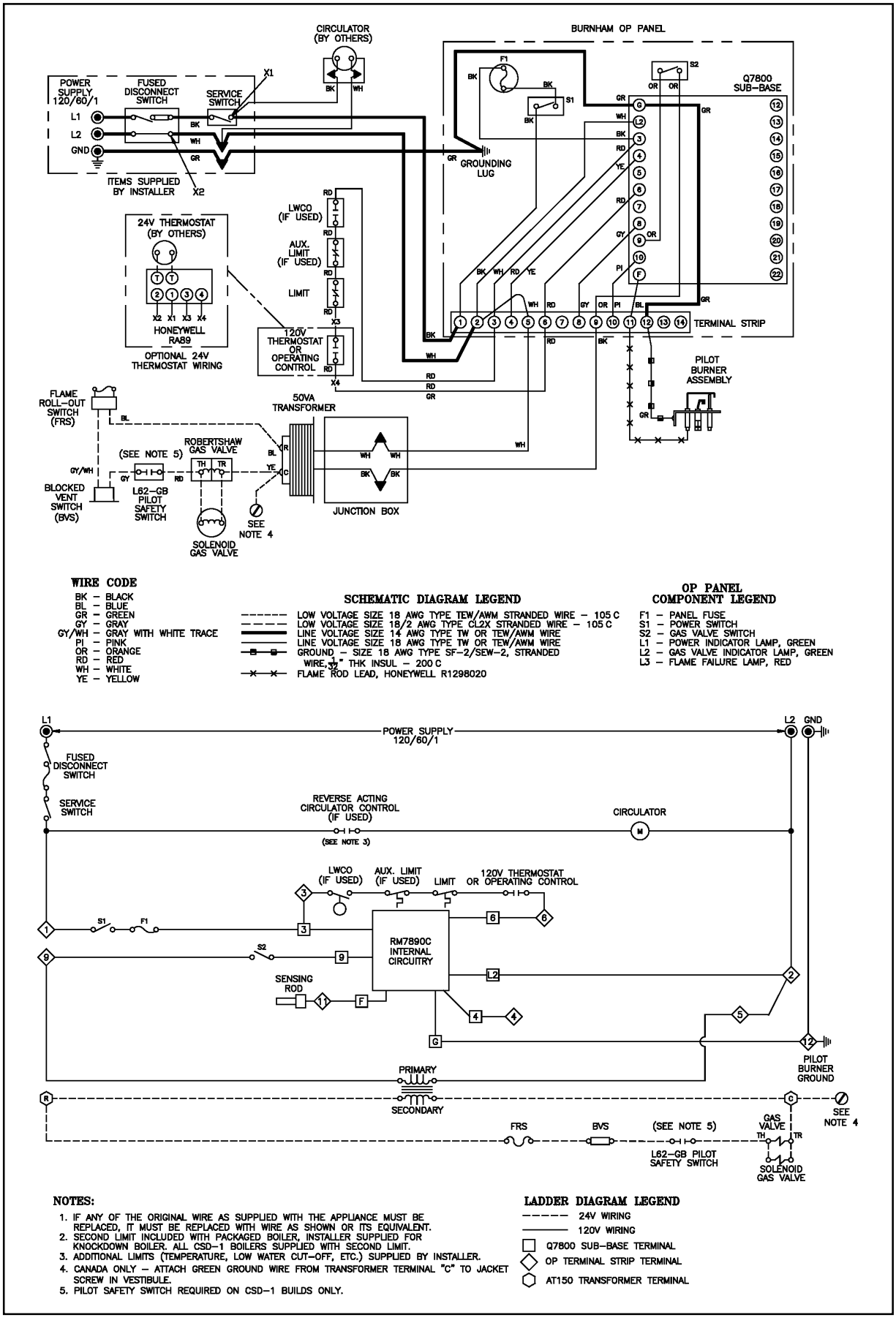


Figure 33: Wiring Diagram, OP/OP-CSD-1 Ignition System, Continuous Circulation

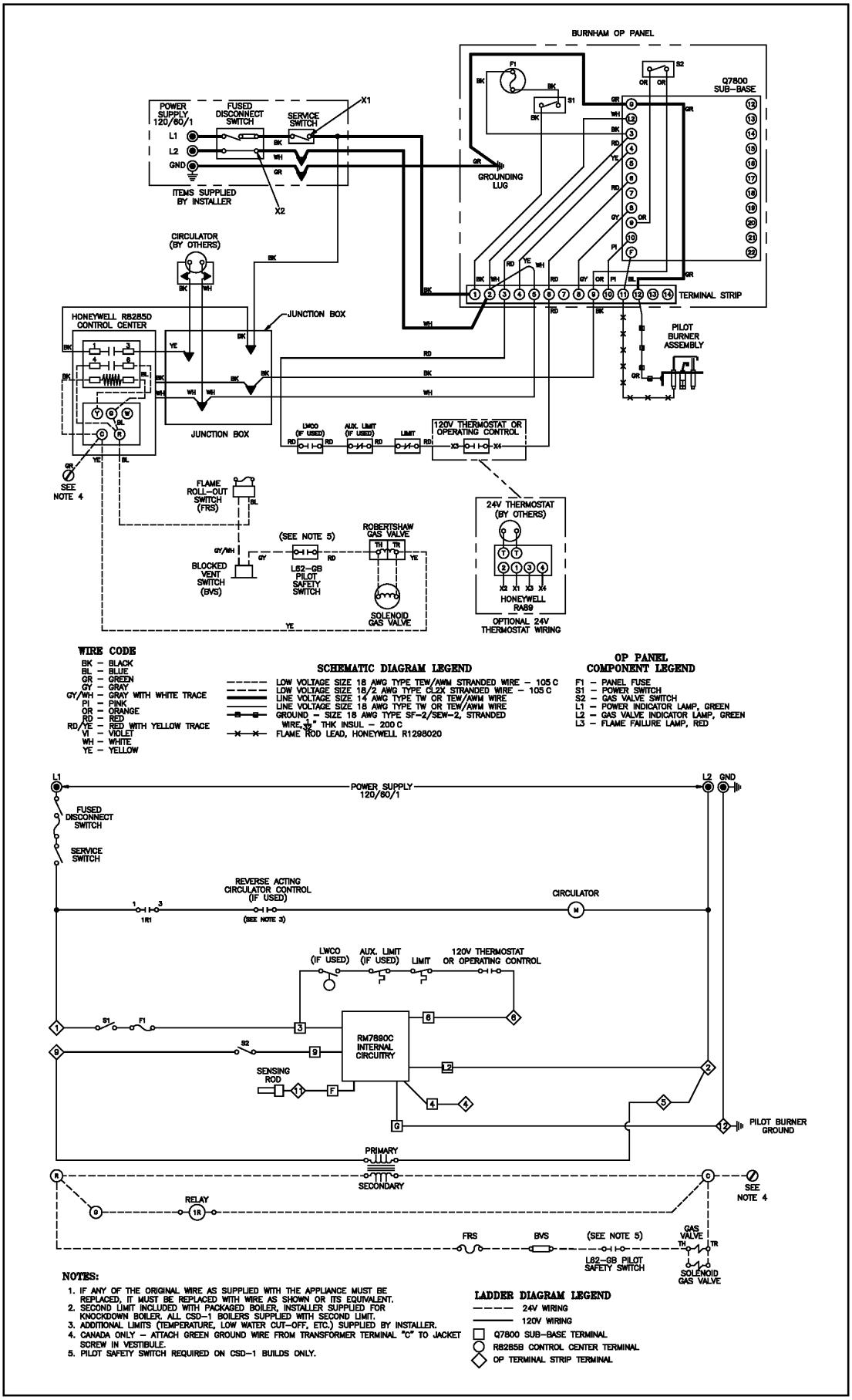

BURNHAM OP PANEL
Q7800 SUB-BASE
TERMINAL STRIP
POWER SUPPLY 120/60/1
FUSED DISCONNECT SWITCH
SERVICE SWITCH
ITEMS SUPPLIED BY INSTALLER
GROUNDING LUG
CIRCULATOR (BY OTHERS)
HONEYWELL R8285D CONTROL CENTER
JUNCTION BOX
PILOT BURNER ASSEMBLY
LWCO (IF USED)
AUX. LIMIT (IF USED)
LIMIT
120V THERMOSTAT OR OPERATING CONTROL
SEE NOTE 4
FLAME ROLL-OUT SWITCH (FRS)
(SEE NOTE 5)
ROBERTSHAW GAS VALVE
BLOCKED VENT SWITCH (BVS)
L82-GB PILOT SAFETY SWITCH
SOLENOID GAS VALVE
24V THERMOSTAT (BY OTHERS)
HONEYWELL RA89
OPTIONAL 24V THERMOSTAT WIRING
WIRE CODE
BK - BLACK
BL - BLUE
GR - GREEN
GY - GRAY
GY/WH - GRAY WITH WHITE TRACE
PI - PINK
OR - ORANGE
RD - RED
RD/YE - RED WITH YELLOW TRACE
VI - VIOLET
WH - WHITE
YE - YELLOW
SCHEMATIC DIAGRAM LEGEND
LOW VOLTAGE SIZE 18 AWG TYPE TEW/AWM STRANDED WIRE - 105 C
LOW VOLTAGE SIZE 18/2 AWG TYPE CL2X STRANDED WIRE - 105 C
LINE VOLTAGE SIZE 14 AWG TYPE TW OR TEW/AWM WIRE
LINE VOLTAGE SIZE 18 AWG TYPE TW OR TEW/AWM WIRE
GROUND - SIZE 18 AWG TYPE SF-2/SEW-2, STRANDED WIRE, 1/32" THK INSUL - 200 C
FLAME ROD LEAD, HONEYWELL R1298020
OP PANEL COMPONENT LEGEND
F1 - PANEL FUSE
S1 - POWER SWITCH
S2 - GAS VALVE SWITCH
L1 - POWER INDICATOR LAMP, GREEN
L2 - GAS VALVE INDICATOR LAMP, GREEN
L3 - FLAME FAILURE LAMP, RED
L1
L2 GND
POWER SUPPLY 120/60/1
FUSED DISCONNECT SWITCH
SERVICE SWITCH
REVERSE ACTING CIRCULATOR CONTROL (IF USED)
CIRCULATOR
(SEE NOTE 3)
LWCO (IF USED)
AUX. LIMIT (IF USED)
LIMIT
120V THERMOSTAT OR OPERATING CONTROL
RM7890C INTERNAL CIRCUITRY
SENSING ROD
PILOT BURNER GROUND
PRIMARY
SECONDARY
SEE NOTE 4
RELAY
FRS
BVS
(SEE NOTE 5)
GAS VALVE
L82-GB PILOT SAFETY SWITCH
SOLENOID GAS VALVE
NOTES:
1. IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRE AS SHOWN OR ITS EQUIVALENT.
2. SECOND LIMIT INCLUDED WITH PACKAGED BOILER, INSTALLER SUPPLIED FOR KNOCKDOWN BOILER. ALL CSD-1 BOILERS SUPPLIED WITH SECOND LIMIT.
3. ADDITIONAL LIMITS (TEMPERATURE, LOW WATER CUT-OFF, ETC.) SUPPLIED BY INSTALLER.
4. CANADA ONLY - ATTACH GREEN GROUND WIRE FROM TRANSFORMER TERMINAL "C" TO JACKET SCREW IN VESTIBULE.
5. PILOT SAFETY SWITCH REQUIRED ON CSD-1 BUILDS ONLY.
LADDER DIAGRAM LEGEND
24V WIRING
120V WIRING
Q7800 SUB-BASE TERMINAL
R8285B CONTROL CENTER TERMINAL
OP TERMINAL STRIP TERMINAL

Figure 34: Wiring Diagram, OP/OP-CSD-1 Ignition System, Intermittent Circulation

4. Honeywell EI Sequence of Operation

   a. Normal Operation

      i. Thermostat or operating control calls for heat. Vent Damper (if used) opens.

      ii. Ignition Module Terminals PV, MV/PV and the Ignition Terminal are energized. Terminals PV and MV/PV power the Pilot Valve in the Gas Valve supplying gas to the Pilot. The Ignition Terminal supplies voltage to the Ignition Electrode creating an electric spark to ignite the Pilot.

      iii. The sensing Circuit between the Q348 Pilot Burner and the IGNITION MODULE proves the presence of the Pilot Flame Electronically and the Ignition Terminal is de-energized.

      iv. Terminals MV and MV/PV of the IGNITION MODULE are energized and supply power to the Main Gas Valve. The Gas Valve is energized allowing main gas flow, and ignition of Main Burners.

      v. Call for heat ends. Ignition module is de-energized, de-energizing gas valve, and extinguishing pilot and main flame. Vent Damper (if used) closes.

   b. Safety Shutdown

      i. Limit: Automatically interrupts power to the Ignition Module and Gas Valve(s), extinguishing pilot and main flame, when water temperature exceeds set point. Maximum allowable temperature is 250°F. Circulator continues to operate with call for heat, Vent Damper (if used) closes. Normal operation resumes when water temperature falls below set point.

      ii. Blocked Vent Switch: Automatically interrupts main burner operation when excessive flue gas spillage occurs. Circulator continues to operate and Vent Damper (if used) remains open with call for heat. If blocked vent switch is activated do not attempt to place boiler in operation. Correct cause of spillage and reset blocked vent switch.

      iii. Flame Roll-out switch: Automatically interrupts main burner operation when flames or excessive heat are present in vestibule. Circulator continues to operate, Vent Damper (if used) remains open with call for heat. Control is single use device. If flame roll-out switch is activated, do not attempt to place boiler in operation. Correct cause of spillage and replace flame roll-out switch.

      iv. Pilot

      – Pilot failure can occur during the start-up or the operating cycle of the boiler. Any pilot failure of the Q348 Electronic Pilot, after ignition of pilot flame will close the main gas valve in 0.8 seconds.

      – For approximately 90 seconds after failure of the Q348 pilot, the module through the ignition terminal will try to reestablish pilot flame. If no pilot flame can be sensed by the flame rod circuit, terminals PV and MV/PV are de-energized and the module will lock out on safety. Five to six minutes after shutdown, the IGNITION MODULE restarts the ignition sequence. The ignition trial, shutdown, and wait sequence continues until either the pilot lights or the Thermostat is set below room temperature (to end the call for heat). The ignition sequence can be reset by setting down the Thermostat for one minute.

   c. Trouble Shooting Guide. See Page 71.

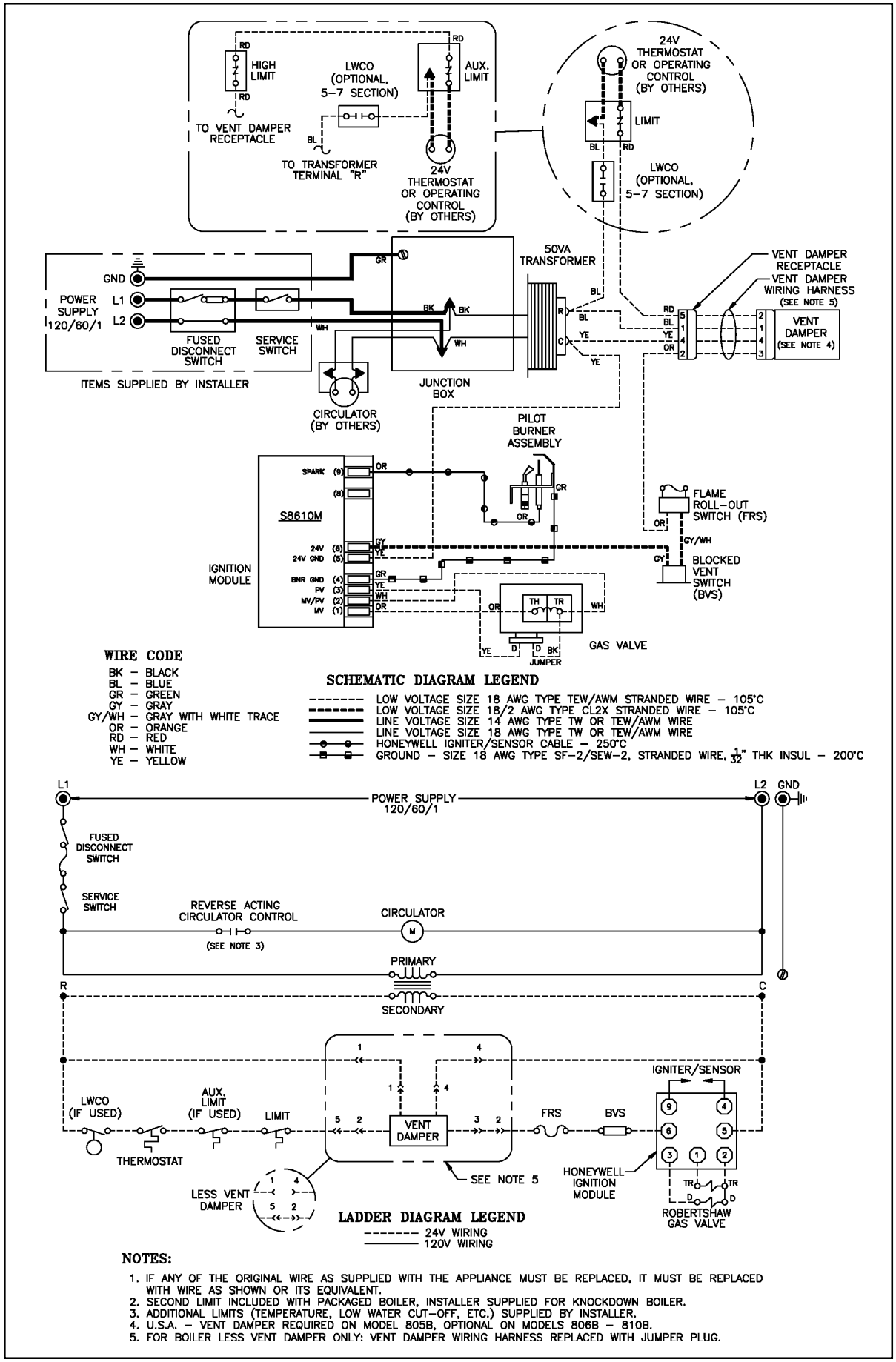


Figure 35: Wiring Diagram, Honeywell EI, USA, Continuous Circulation

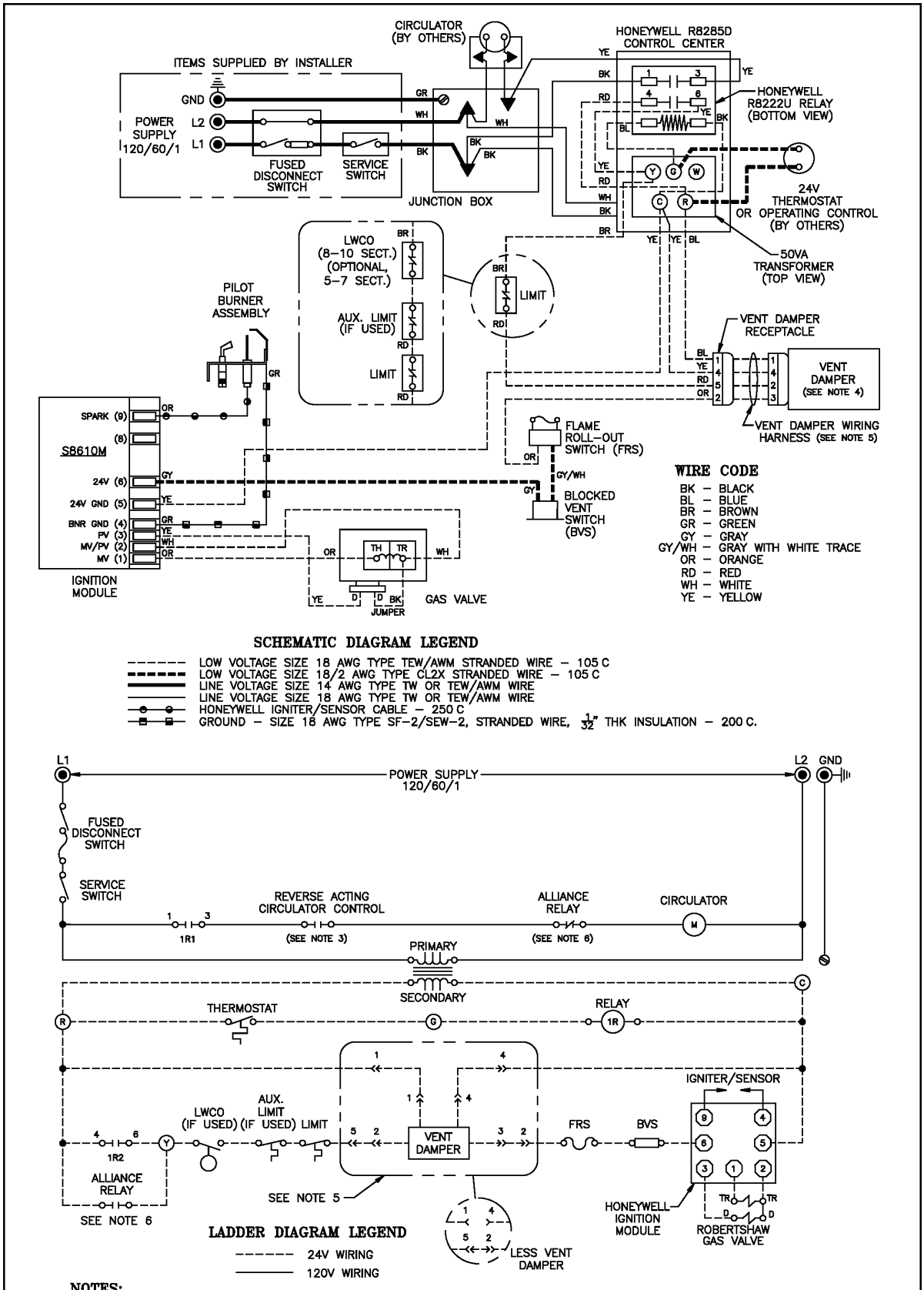


Figure 36: Wiring Diagram, Honeywell EI, USA, Intermittent Circulation

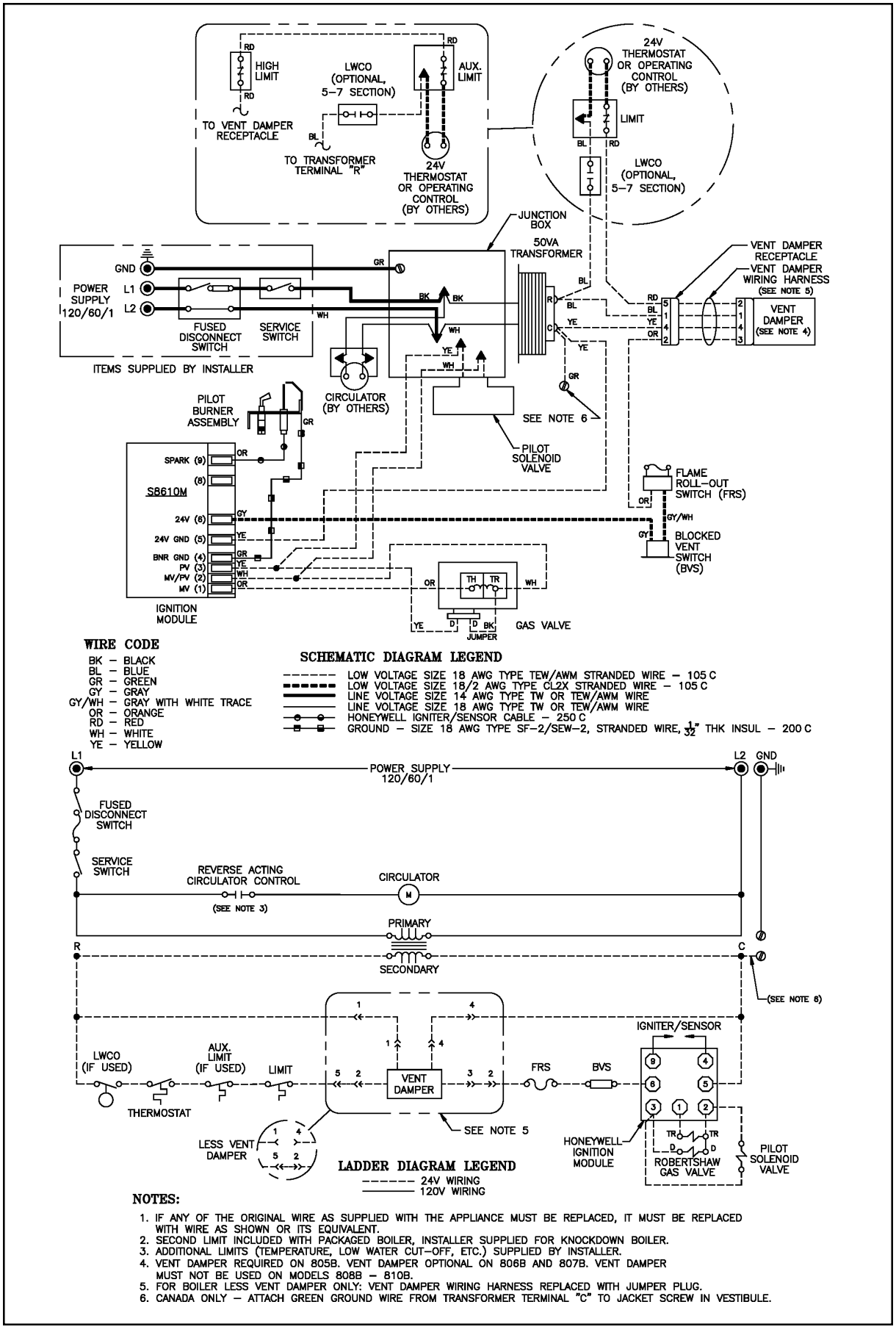

HIGH LIMIT
LWCO (OPTIONAL, 5–7 SECTION)
AUX. LIMIT
TO VENT DAMPER RECEPTACLE
TO TRANSFORMER TERMINAL "R"
24V THERMOSTAT OR OPERATING CONTROL (BY OTHERS)
LIMIT
JUNCTION BOX
50VA TRANSFORMER
VENT DAMPER RECEPTACLE
VENT DAMPER WIRING HARNESS (SEE NOTE 5)
VENT DAMPER (SEE NOTE 4)
POWER SUPPLY 120/60/1
FUSED DISCONNECT SWITCH
SERVICE SWITCH
ITEMS SUPPLIED BY INSTALLER
CIRCULATOR (BY OTHERS)
PILOT BURNER ASSEMBLY
SEE NOTE 6
PILOT SOLENOID VALVE
FLAME ROLL–OUT SWITCH (FRS)
BLOCKED VENT SWITCH (BVS)
IGNITION MODULE
S8610M
GAS VALVE
JUMPER
WIRE CODE
BK – BLACK
BL – BLUE
GR – GREEN
GY – GRAY
GY/WH – GRAY WITH WHITE TRACE
OR – ORANGE
RD – RED
WH – WHITE
YE – YELLOW
SCHEMATIC DIAGRAM LEGEND
LOW VOLTAGE SIZE 18 AWG TYPE TEW/AWM STRANDED WIRE – 105 C
LOW VOLTAGE SIZE 18/2 AWG TYPE CL2X STRANDED WIRE – 105 C
LINE VOLTAGE SIZE 14 AWG TYPE TW OR TEW/AWM WIRE
LINE VOLTAGE SIZE 18 AWG TYPE TW OR TEW/AWM WIRE
HONEYWELL IGNITER/SENSOR CABLE – 250 C
GROUND – SIZE 18 AWG TYPE SF–2/SEW–2, STRANDED WIRE, 1/32" THK INSUL – 200 C
POWER SUPPLY 120/60/1
FUSED DISCONNECT SWITCH
SERVICE SWITCH
REVERSE ACTING CIRCULATOR CONTROL
(SEE NOTE 3)
CIRCULATOR
PRIMARY
SECONDARY
(SEE NOTE 6)
LWCO (IF USED)
AUX. LIMIT (IF USED)
LIMIT
THERMOSTAT
VENT DAMPER
SEE NOTE 5
FRS
BVS
IGNITER/SENSOR
LESS VENT DAMPER
HONEYWELL IGNITION MODULE
ROBERTSHAW GAS VALVE
PILOT SOLENOID VALVE
LADDER DIAGRAM LEGEND
24V WIRING
120V WIRING
NOTES:
1. IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRE AS SHOWN OR ITS EQUIVALENT.
2. SECOND LIMIT INCLUDED WITH PACKAGED BOILER, INSTALLER SUPPLIED FOR KNOCKDOWN BOILER.
3. ADDITIONAL LIMITS (TEMPERATURE, LOW WATER CUT–OFF, ETC.) SUPPLIED BY INSTALLER.
4. VENT DAMPER REQUIRED ON 805B. VENT DAMPER OPTIONAL ON 806B AND 807B. VENT DAMPER MUST NOT BE USED ON MODELS 808B – 810B.
5. FOR BOILER LESS VENT DAMPER ONLY: VENT DAMPER WIRING HARNESS REPLACED WITH JUMPER PLUG.
6. CANADA ONLY – ATTACH GREEN GROUND WIRE FROM TRANSFORMER TERMINAL "C" TO JACKET SCREW IN VESTIBULE.

Figure 37: Wiring Diagram, Honeywell EI, Canada, Continuous Circulation

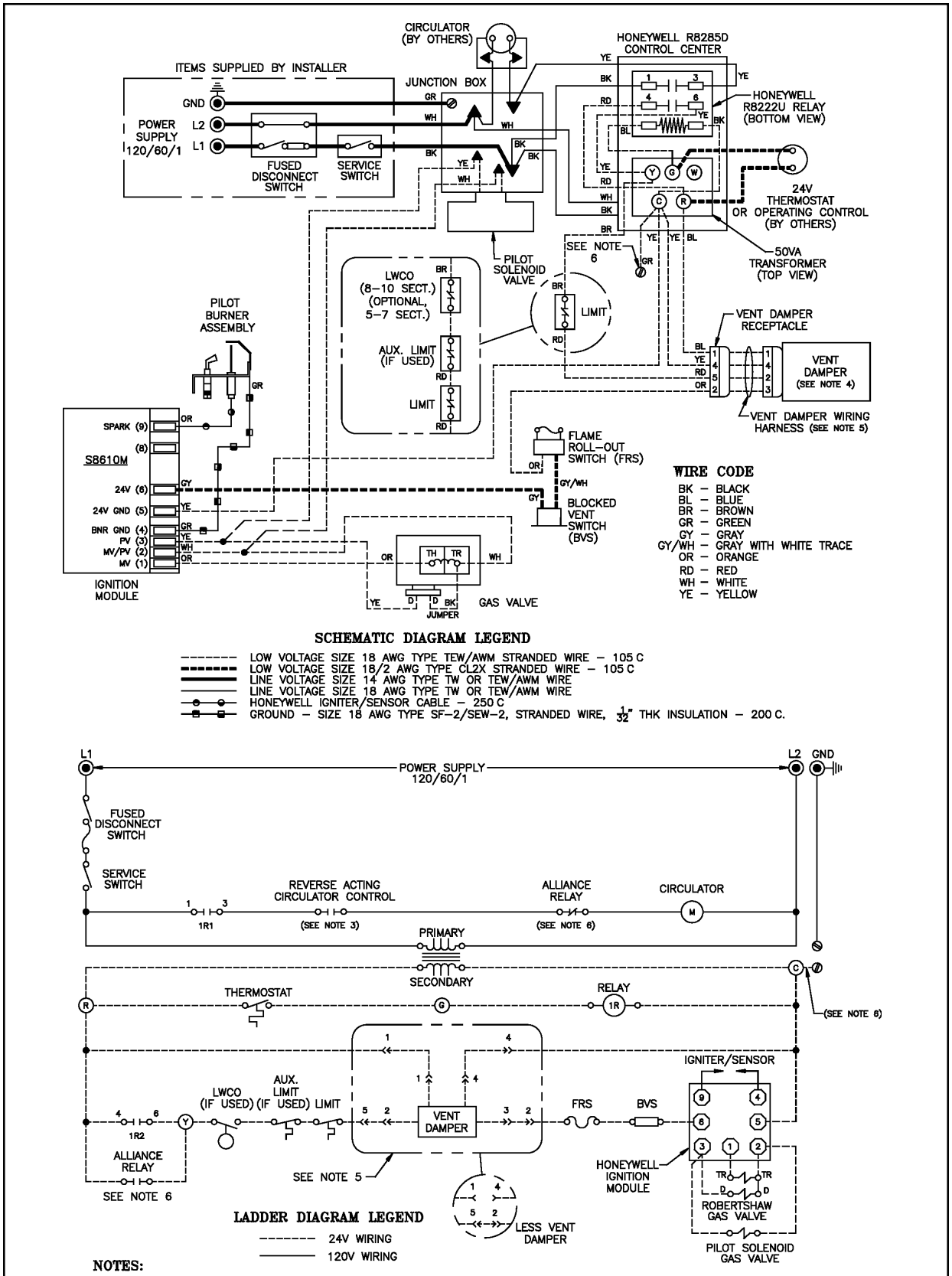

CIRCULATOR (BY OTHERS)
HONEYWELL R8285D CONTROL CENTER
ITEMS SUPPLIED BY INSTALLER
JUNCTION BOX
GND
POWER SUPPLY 120/60/1
L2
L1
FUSED DISCONNECT SWITCH
SERVICE SWITCH
HONEYWELL R8222U RELAY (BOTTOM VIEW)
24V THERMOSTAT OR OPERATING CONTROL (BY OTHERS)
50VA TRANSFORMER (TOP VIEW)
SEE NOTE 6
PILOT SOLENOID VALVE
LWCO (8–10 SECT.) (OPTIONAL, 5–7 SECT.)
AUX. LIMIT (IF USED)
LIMIT
PILOT BURNER ASSEMBLY
VENT DAMPER RECEPTACLE
VENT DAMPER (SEE NOTE 4)
VENT DAMPER WIRING HARNESS (SEE NOTE 5)
FLAME ROLL–OUT SWITCH (FRS)
BLOCKED VENT SWITCH (BVS)
S8610M
SPARK (9)
(8)
24V (6)
24V GND (5)
BNR GND (4)
PV (3)
MV/PV (2)
MV (1)
IGNITION MODULE
TH
TR
GAS VALVE
JUMPER
WIRE CODE
BK – BLACK
BL – BLUE
BR – BROWN
GR – GREEN
GY – GRAY
GY/WH – GRAY WITH WHITE TRACE
OR – ORANGE
RD – RED
WH – WHITE
YE – YELLOW
SCHEMATIC DIAGRAM LEGEND
LOW VOLTAGE SIZE 18 AWG TYPE TEW/AWM STRANDED WIRE – 105 C
LOW VOLTAGE SIZE 18/2 AWG TYPE CL2X STRANDED WIRE – 105 C
LINE VOLTAGE SIZE 14 AWG TYPE TW OR TEW/AWM WIRE
LINE VOLTAGE SIZE 18 AWG TYPE TW OR TEW/AWM WIRE
HONEYWELL IGNITER/SENSOR CABLE – 250 C
GROUND – SIZE 18 AWG TYPE SF–2/SEW–2, STRANDED WIRE, 1/32" THK INSULATION – 200 C.
L1
POWER SUPPLY 120/60/1
L2
GND
FUSED DISCONNECT SWITCH
SERVICE SWITCH
REVERSE ACTING CIRCULATOR CONTROL
ALLIANCE RELAY
CIRCULATOR
1R1
(SEE NOTE 3)
(SEE NOTE 6)
PRIMARY
SECONDARY
THERMOSTAT
RELAY
1R
(SEE NOTE 6)
IGNITER/SENSOR
AUX. LIMIT (IF USED)
LWCO (IF USED)
LIMIT
VENT DAMPER
FRS
BVS
1R2
ALLIANCE RELAY
SEE NOTE 6
SEE NOTE 5
HONEYWELL IGNITION MODULE
ROBERTSHAW GAS VALVE
PILOT SOLENOID GAS VALVE
LESS VENT DAMPER
LADDER DIAGRAM LEGEND
24V WIRING
120V WIRING
NOTES:
1. IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRE AS SHOWN OR ITS EQUIVALENT.
2. SECOND LIMIT INCLUDED WITH PACKAGED BOILER, INSTALLER SUPPLIED FOR KNOCKDOWN BOILER.
3. ADDITIONAL LIMITS (TEMPERATURE, LOW WATER CUT–OFF, ETC.) SUPPLIED BY INSTALLER.
4. VENT DAMPER REQUIRED ON 805B. VENT DAMPER OPTIONAL ON 806B AND 807B. VENT DAMPER MUST NOT BE USED ON MODELS 808B – 810B.
5. FOR BOILER LESS VENT DAMPER ONLY: VENT DAMPER WIRING HARNESS REPLACED WITH JUMPER PLUG.
6. CANADA ONLY – ATTACH GREEN GROUND WIRE FROM TRANSFORMER TERMINAL "C" TO JACKET SCREW IN VESTIBULE.

Figure 38: Wiring Diagram, Honeywell EI, Canada, Intermittent Circulation

5. Johnson EI Sequence of Operation

   a. Normal Operation

      i. Thermostat or operating control calls for heat. Vent Damper (if used) opens.

      ii. Ignition Module Terminals 1, GND and the Ignition Terminal are energized. Terminals 1 and GND power the Pilot Valve in the Gas Valve supplying as to the Pilot. The Ignition Terminal supplies voltage to the Ignition Electrode creating an electric spark to ignite the Pilot.

      iii. The sensing Circuit between the J991 Pilot Burner and the IGNITION MODULE proves the presence of the Pilot Flame electronically and the Ignition Terminal is de-energized.

      iv. Terminals 3 and GND of the IGNITION MODULE are energized and supply power to the Main Gas Valve. The Gas Valve is energized allowing main gas flow, and ignition of Main Burners.

      v. Call for heat ends. Ignition module is de-energized, de-energizing gas valve, and extinguishing pilot and main flame. Vent Damper (if used) closes.

   b. Safety Shutdown

      i. Limit: Automatically interrupts power to the Ignition Module and Gas Valve(s), extinguishing pilot and main flame, when water temperature exceeds set point. Maximum allowable temperature is 250°F. Circulator continues to operate with call for heat, Vent Damper (if used) closes. Normal operation resumes when water temperature falls below set point.

      ii. Blocked Vent Switch: Automatically interrupts main burner operation when excessive flue gas spillage occurs. Circulator continues to operate, Vent Damper (if used) remains open with call for heat. If blocked vent switch is activated do not attempt to place boiler in operation. Correct cause of spillage and reset blocked vent switch.

      iii. Flame Roll-out switch: automatically interrupts main burner operation when flames or excessive heat are present in vestibule. Circulator continues to operate, Vent Damper (if used) remains open with call for heat. Control is single use device. If flame roll-out switch is activated, do not attempt to place boiler in operation. Correct cause of spillage and replace flame roll-out switch.

      iv. Pilot:

      – Pilot failure can occur during the start-up or the operating cycle of the boiler. Any pilot failure of the J991 Electronic Pilot, after ignition of pilot flame will close the main gas valve.

      – For approximately 90 seconds after failure of the J991 pilot, the module through the ignition terminal will try to reestablish pilot flame. If no pilot flame can be sensed by the flame rod circuit, terminals 1 and GND are de-energized and the module will lock out on safety. Five to six minutes after shutdown, the IGNITION MODULE restarts the ignition sequence. The ignition trial, shutdown, and wait sequence continues until either the pilot lights or the Thermostat is set below room temperature (to end the call for heat). The ignition sequence can be reset by setting down the Thermostat for one minute.

   c. Trouble Shooting Guide. See Pages 72 and 73.

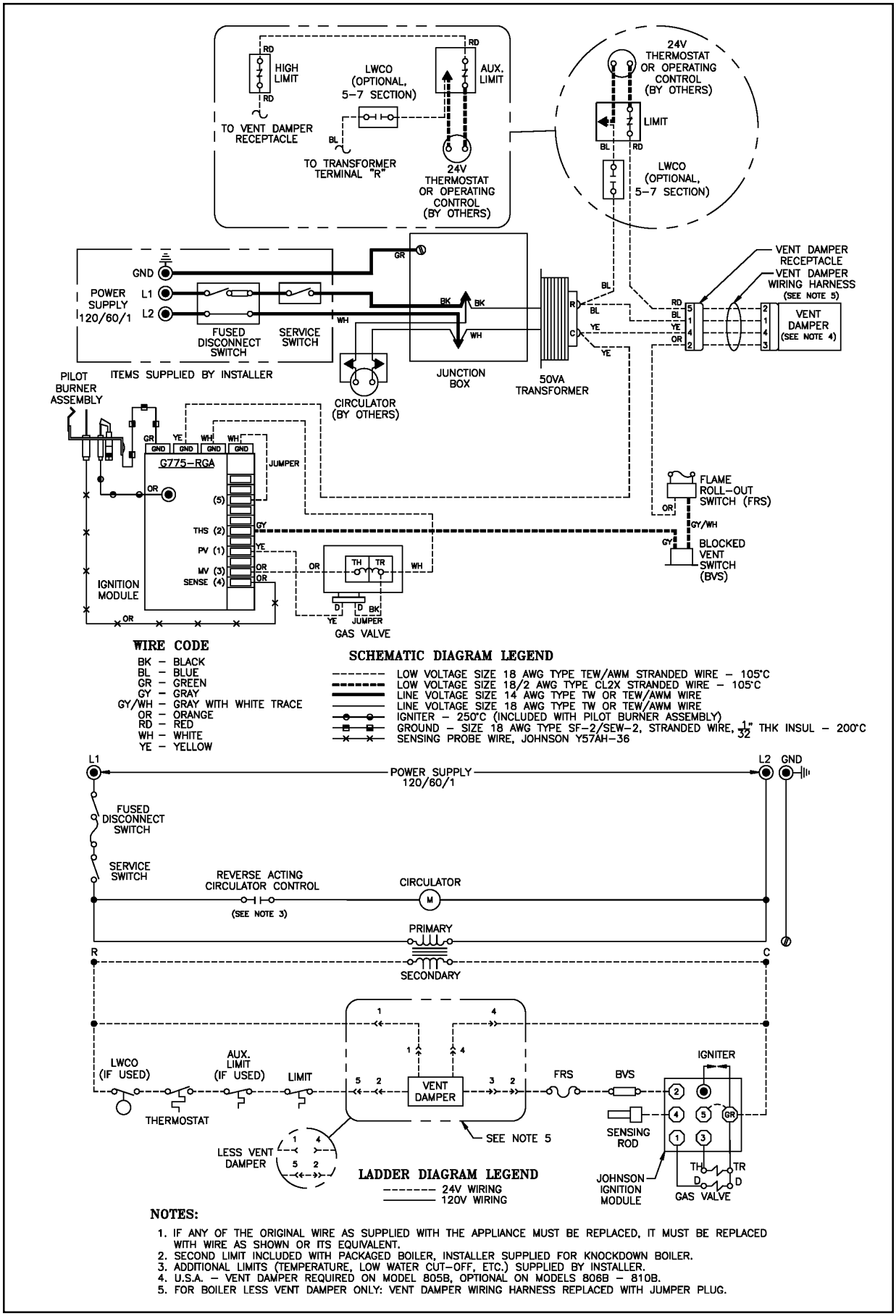
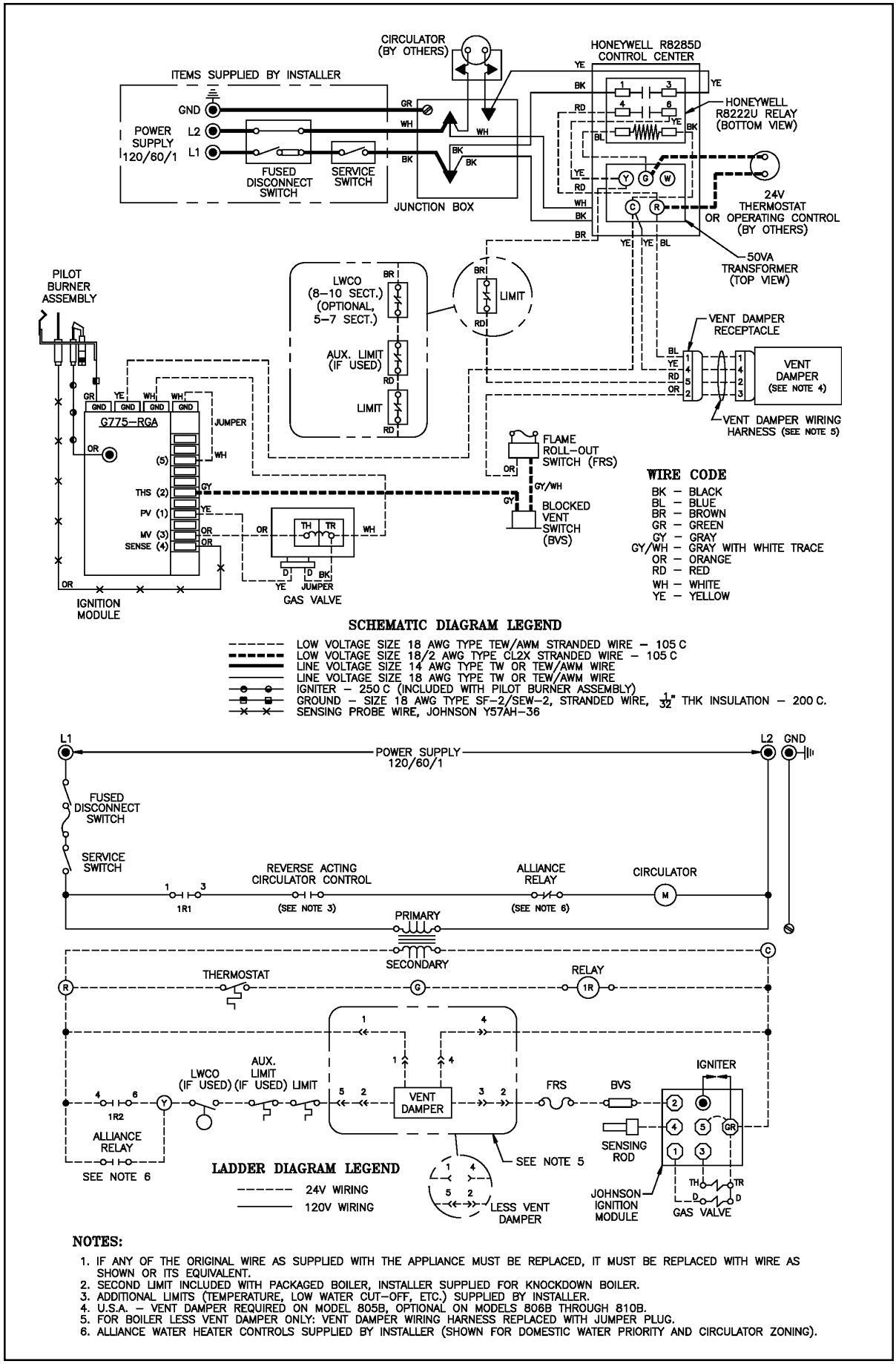

HIGH LIMIT
LWCO (OPTIONAL, 5-7 SECTION)
AUX. LIMIT
TO VENT DAMPER RECEPTACLE
TO TRANSFORMER TERMINAL "R"
24V THERMOSTAT OR OPERATING CONTROL (BY OTHERS)
LIMIT
LWCO (OPTIONAL, 5-7 SECTION)
POWER SUPPLY 120/60/1
GND
L1
L2
FUSED DISCONNECT SWITCH
SERVICE SWITCH
ITEMS SUPPLIED BY INSTALLER
JUNCTION BOX
50VA TRANSFORMER
CIRCULATOR (BY OTHERS)
VENT DAMPER RECEPTACLE
VENT DAMPER WIRING HARNESS (SEE NOTE 5)
VENT DAMPER (SEE NOTE 4)
PILOT BURNER ASSEMBLY
G775-RGA
JUMPER
IGNITION MODULE
THS (2)
PV (1)
MV (3)
SENSE (4)
TH
TR
GAS VALVE
FLAME ROLL-OUT SWITCH (FRS)
BLOCKED VENT SWITCH (BVS)
WIRE CODE
BK - BLACK
BL - BLUE
GR - GREEN
GY - GRAY
GY/WH - GRAY WITH WHITE TRACE
OR - ORANGE
RD - RED
WH - WHITE
YE - YELLOW
SCHEMATIC DIAGRAM LEGEND
LOW VOLTAGE SIZE 18 AWG TYPE TEW/AWM STRANDED WIRE - 105°C
LOW VOLTAGE SIZE 18/2 AWG TYPE CL2X STRANDED WIRE - 105°C
LINE VOLTAGE SIZE 14 AWG TYPE TW OR TEW/AWM WIRE
LINE VOLTAGE SIZE 18 AWG TYPE TW OR TEW/AWM WIRE
IGNITER - 250°C (INCLUDED WITH PILOT BURNER ASSEMBLY)
GROUND - SIZE 18 AWG TYPE SF-2/SEW-2, STRANDED WIRE, 1/32" THK INSUL - 200°C
SENSING PROBE WIRE, JOHNSON Y57AH-36
POWER SUPPLY 120/60/1
FUSED DISCONNECT SWITCH
SERVICE SWITCH
REVERSE ACTING CIRCULATOR CONTROL
(SEE NOTE 3)
CIRCULATOR
PRIMARY
SECONDARY
LWCO (IF USED)
AUX. LIMIT (IF USED)
LIMIT
THERMOSTAT
VENT DAMPER
LESS VENT DAMPER
SEE NOTE 5
FRS
BVS
IGNITER
SENSING ROD
JOHNSON IGNITION MODULE
GAS VALVE
LADDER DIAGRAM LEGEND
24V WIRING
120V WIRING
NOTES:
1. IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRE AS SHOWN OR ITS EQUIVALENT.
2. SECOND LIMIT INCLUDED WITH PACKAGED BOILER, INSTALLER SUPPLIED FOR KNOCKDOWN BOILER.
3. ADDITIONAL LIMITS (TEMPERATURE, LOW WATER CUT-OFF, ETC.) SUPPLIED BY INSTALLER.
4. U.S.A. - VENT DAMPER REQUIRED ON MODEL 805B, OPTIONAL ON MODELS 806B - 810B.
5. FOR BOILER LESS VENT DAMPER ONLY: VENT DAMPER WIRING HARNESS REPLACED WITH JUMPER PLUG.

Figure 39: Wiring Diagram, Johnson EI, USA, Continuous Circulation



NOTES:

1. IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRE AS SHOWN OR ITS EQUIVALENT.
2. SECOND LIMIT INCLUDED WITH PACKAGED BOILER, INSTALLER SUPPLIED FOR KNOCKDOWN BOILER.
3. ADDITIONAL LIMITS (TEMPERATURE, LOW WATER CUT–OFF, ETC.) SUPPLIED BY INSTALLER.
4. U.S.A. – VENT DAMPER REQUIRED ON MODEL 805B, OPTIONAL ON MODELS 806B THROUGH 810B.
5. FOR BOILER LESS VENT DAMPER ONLY: VENT DAMPER WIRING HARNESS REPLACED WITH JUMPER PLUG.
6. ALLIANCE WATER HEATER CONTROLS SUPPLIED BY INSTALLER (SHOWN FOR DOMESTIC WATER PRIORITY AND CIRCULATOR ZONING).

Figure 40: Wiring Diagram, Johnson EI, USA, Intermittent Circulation

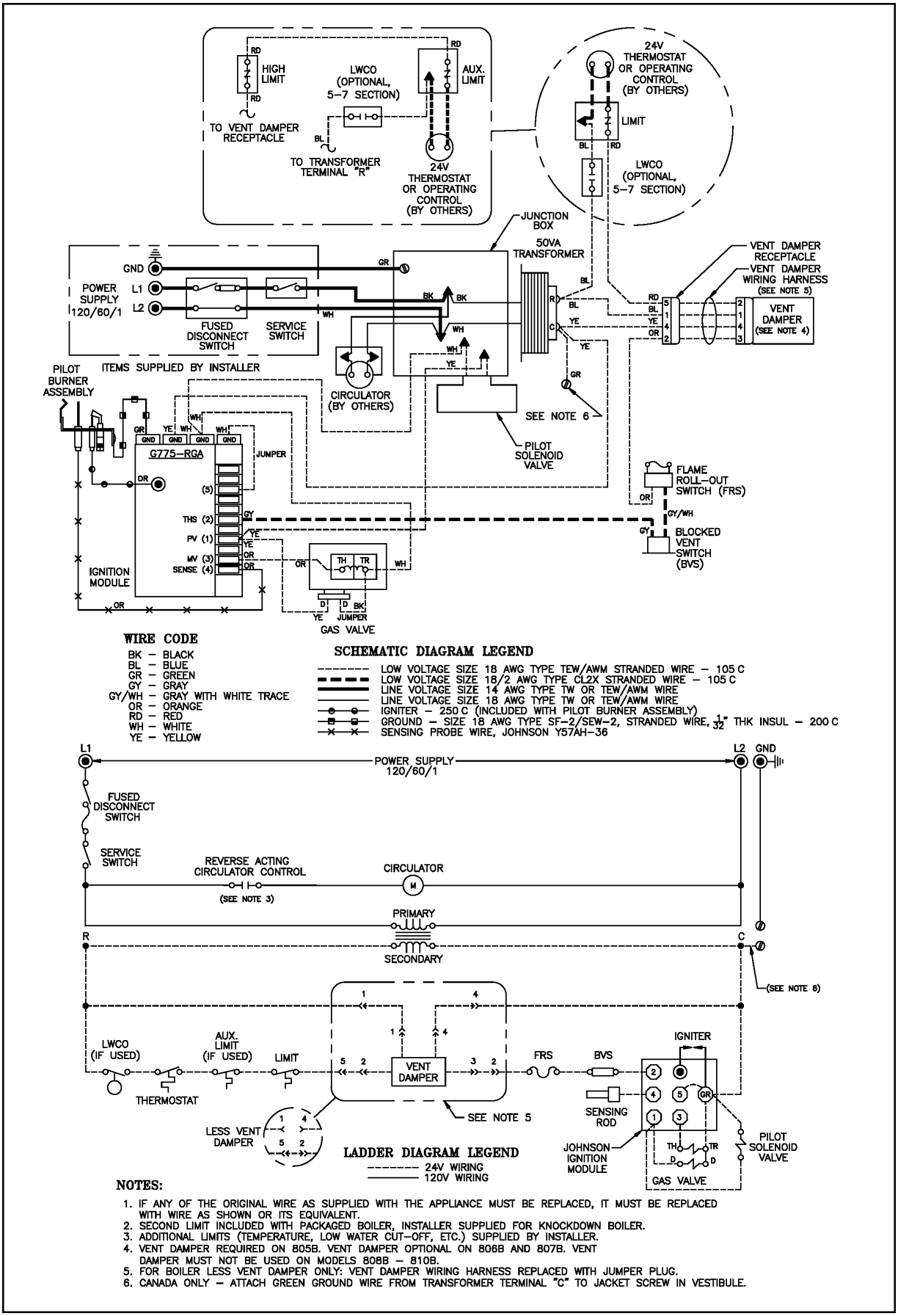
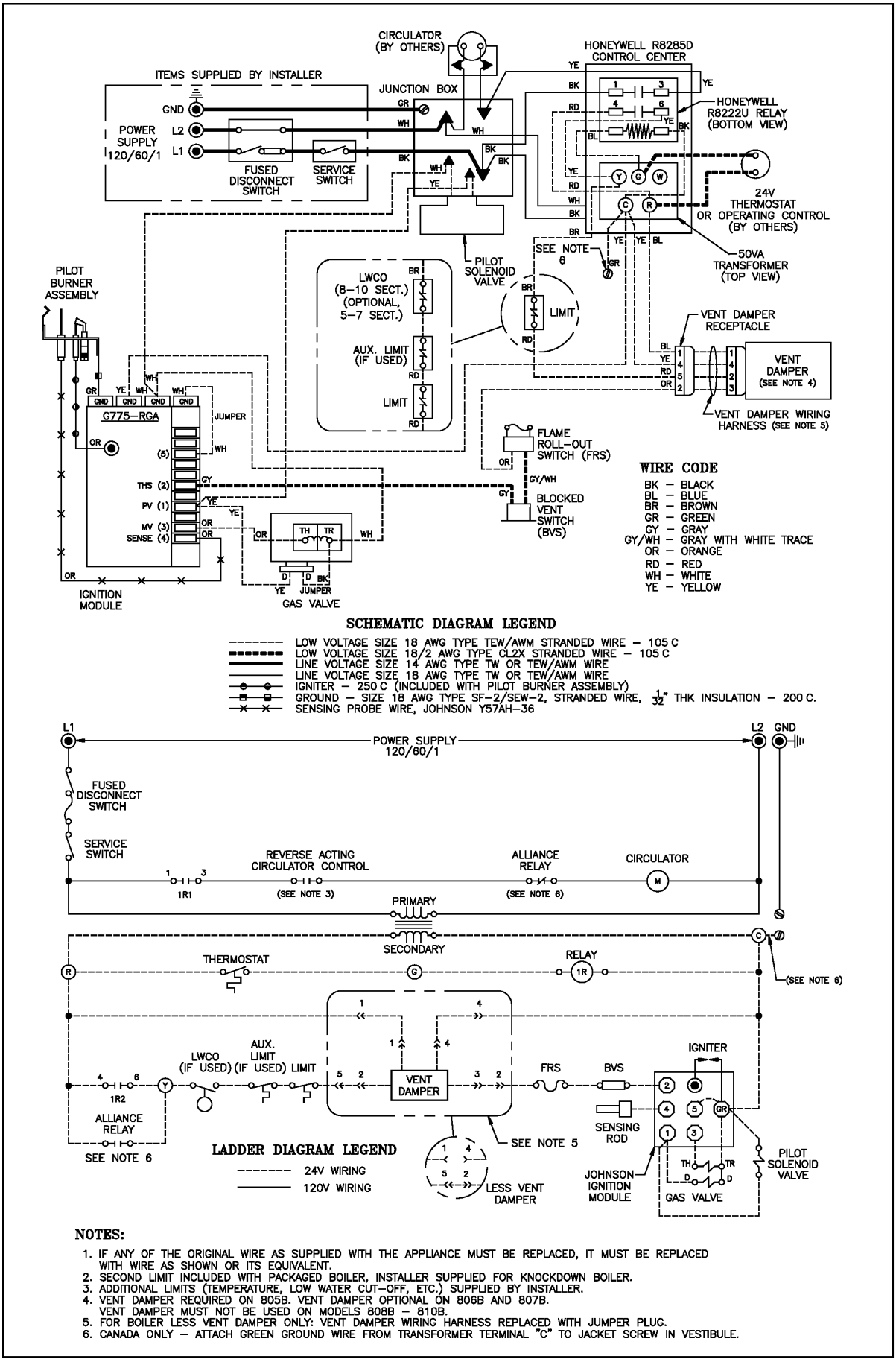

HIGH LIMIT
LWCO (OPTIONAL, 5–7 SECTION)
AUX. LIMIT
TO VENT DAMPER RECEPTACLE
TO TRANSFORMER TERMINAL "R"
24V THERMOSTAT OR OPERATING CONTROL (BY OTHERS)
LIMIT
LWCO (OPTIONAL, 5–7 SECTION)
JUNCTION BOX
50VA TRANSFORMER
VENT DAMPER RECEPTACLE
VENT DAMPER WIRING HARNESS (SEE NOTE 5)
VENT DAMPER (SEE NOTE 4)
POWER SUPPLY 120/60/1
FUSED DISCONNECT SWITCH
SERVICE SWITCH
ITEMS SUPPLIED BY INSTALLER
PILOT BURNER ASSEMBLY
CIRCULATOR (BY OTHERS)
SEE NOTE 6
PILOT SOLENOID VALVE
G775-RGA
JUMPER
IGNITION MODULE
GAS VALVE
FLAME ROLL-OUT SWITCH (FRS)
BLOCKED VENT SWITCH (BVS)
WIRE CODE
BK – BLACK
BL – BLUE
GR – GREEN
GY – GRAY
GY/WH – GRAY WITH WHITE TRACE
OR – ORANGE
RD – RED
WH – WHITE
YE – YELLOW
SCHEMATIC DIAGRAM LEGEND
LOW VOLTAGE SIZE 18 AWG TYPE TEW/AWM STRANDED WIRE – 105 C
LOW VOLTAGE SIZE 18/2 AWG TYPE CL2X STRANDED WIRE – 105 C
LINE VOLTAGE SIZE 14 AWG TYPE TW OR TEW/AWM WIRE
LINE VOLTAGE SIZE 18 AWG TYPE TW OR TEW/AWM WIRE
IGNITER – 250 C (INCLUDED WITH PILOT BURNER ASSEMBLY)
GROUND – SIZE 18 AWG TYPE SF-2/SEW-2, STRANDED WIRE, 1/32" THK INSUL – 200 C
SENSING PROBE WIRE, JOHNSON Y57AH-36
L1
L2
GND
POWER SUPPLY 120/60/1
FUSED DISCONNECT SWITCH
SERVICE SWITCH
REVERSE ACTING CIRCULATOR CONTROL
(SEE NOTE 3)
CIRCULATOR
PRIMARY
SECONDARY
R
C
(SEE NOTE 6)
LWCO (IF USED)
AUX. LIMIT (IF USED)
LIMIT
THERMOSTAT
VENT DAMPER
SEE NOTE 5
LESS VENT DAMPER
FRS
BVS
IGNITER
SENSING ROD
JOHNSON IGNITION MODULE
PILOT SOLENOID VALVE
GAS VALVE
LADDER DIAGRAM LEGEND
24V WIRING
120V WIRING
NOTES:
1. IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRE AS SHOWN OR ITS EQUIVALENT.
2. SECOND LIMIT INCLUDED WITH PACKAGED BOILER, INSTALLER SUPPLIED FOR KNOCKDOWN BOILER.
3. ADDITIONAL LIMITS (TEMPERATURE, LOW WATER CUT-OFF, ETC.) SUPPLIED BY INSTALLER.
4. VENT DAMPER REQUIRED ON 805B. VENT DAMPER OPTIONAL ON 806B AND 807B. VENT DAMPER MUST NOT BE USED ON MODELS 808B – 810B.
5. FOR BOILER LESS VENT DAMPER ONLY: VENT DAMPER WIRING HARNESS REPLACED WITH JUMPER PLUG.
6. CANADA ONLY – ATTACH GREEN GROUND WIRE FROM TRANSFORMER TERMINAL "C" TO JACKET SCREW IN VESTIBULE.

Figure 41: Wiring diagram, Johnson EI, Canada, Continuous Circulation



NOTES:

1. IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRE AS SHOWN OR ITS EQUIVALENT.
2. SECOND LIMIT INCLUDED WITH PACKAGED BOILER, INSTALLER SUPPLIED FOR KNOCKDOWN BOILER.
3. ADDITIONAL LIMITS (TEMPERATURE, LOW WATER CUT-OFF, ETC.) SUPPLIED BY INSTALLER.
4. VENT DAMPER REQUIRED ON 805B. VENT DAMPER OPTIONAL ON 806B AND 807B. VENT DAMPER MUST NOT BE USED ON MODELS 808B - 810B.
5. FOR BOILER LESS VENT DAMPER ONLY: VENT DAMPER WIRING HARNESS REPLACED WITH JUMPER PLUG.
6. CANADA ONLY - ATTACH GREEN GROUND WIRE FROM TRANSFORMER TERMINAL "C" TO JACKET SCREW IN VESTIBULE.

Figure 42: Wiring Diagram, Johnson EI, Canada, Intermittent Circulation

6. Electronically Supervised Intermittent Ignition (EP/EP-CSD-1) Sequence of Operation
   a. Normal Operation
      i. Thermostat or operating control calls for heat.
      ii. Terminal #6 of RM7890A Burner Control is energized, initiating a microcomputer monitored circuit test.
      iii. The pilot valve (terminal 8) and ignition transformer (terminal 10) are energized. The pilot valve opens and the ignition electrode sparks, igniting the pilot.
      iv. After the pilot flame is proven, the ignition terminal (10) is de-energized and the main valve terminal (9) is energized, allowing main gas flow and ignition of main burners. "Main" gas light will be illuminated.
      v. When the call for heat ends, terminal #6 is de-energized, extinguishing the pilot and main flames. "Main" gas light is de-energized.
   b. Safety Shutdown
      i. Limit: Automatically interrupts main burner operation when water temperature exceeds set point. Maximum allowable temperature is 250°F. Circulator continues to operate with call for heat. Normal operation resumes when water temperature falls below set point.
      ii. Blocked Vent Switch: Automatically interrupts main burner operation when excessive flue gas spillage occurs. Circulator continues to operate with call for heat. If blocked vent switch is activated, do not attempt to place boiler in operation. Correct cause of spillage and reset blocked vent switch.
      iii. Flame Roll-out Switch: Automatically interrupts main burner operation when flames or excessive heat are present in vestibule. Circulator continues to operate with call for heat. Control is single use device. If flame roll-out switch is activated, do not attempt to place boiler in operation. Correct cause of spillage and replace flame roll-out switch.
      iv. RM7890A Burner Control: Automatically interrupts main burner operation if a pilot flame is not detected during the four or ten second pilot flame establishing period. The RM7890A will lockout or recycle based on jumper settings. "Alarm" light will be illuminated. Refer to instructions supplied with RM7890A for additional control information.

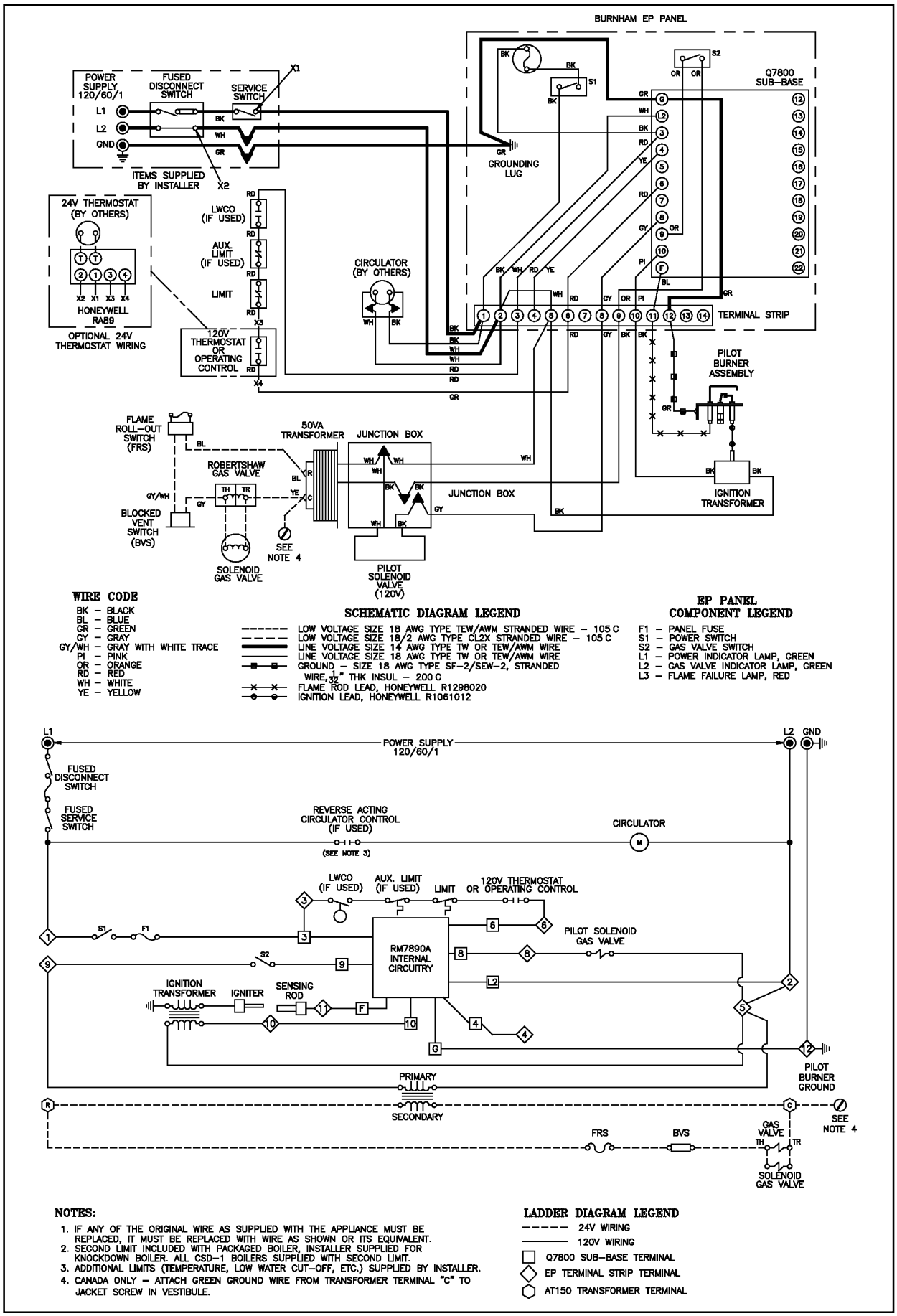


Figure 43: Wiring Diagram, EP/EP-CSD-1 Ignition System, USA, Continuous Circulation

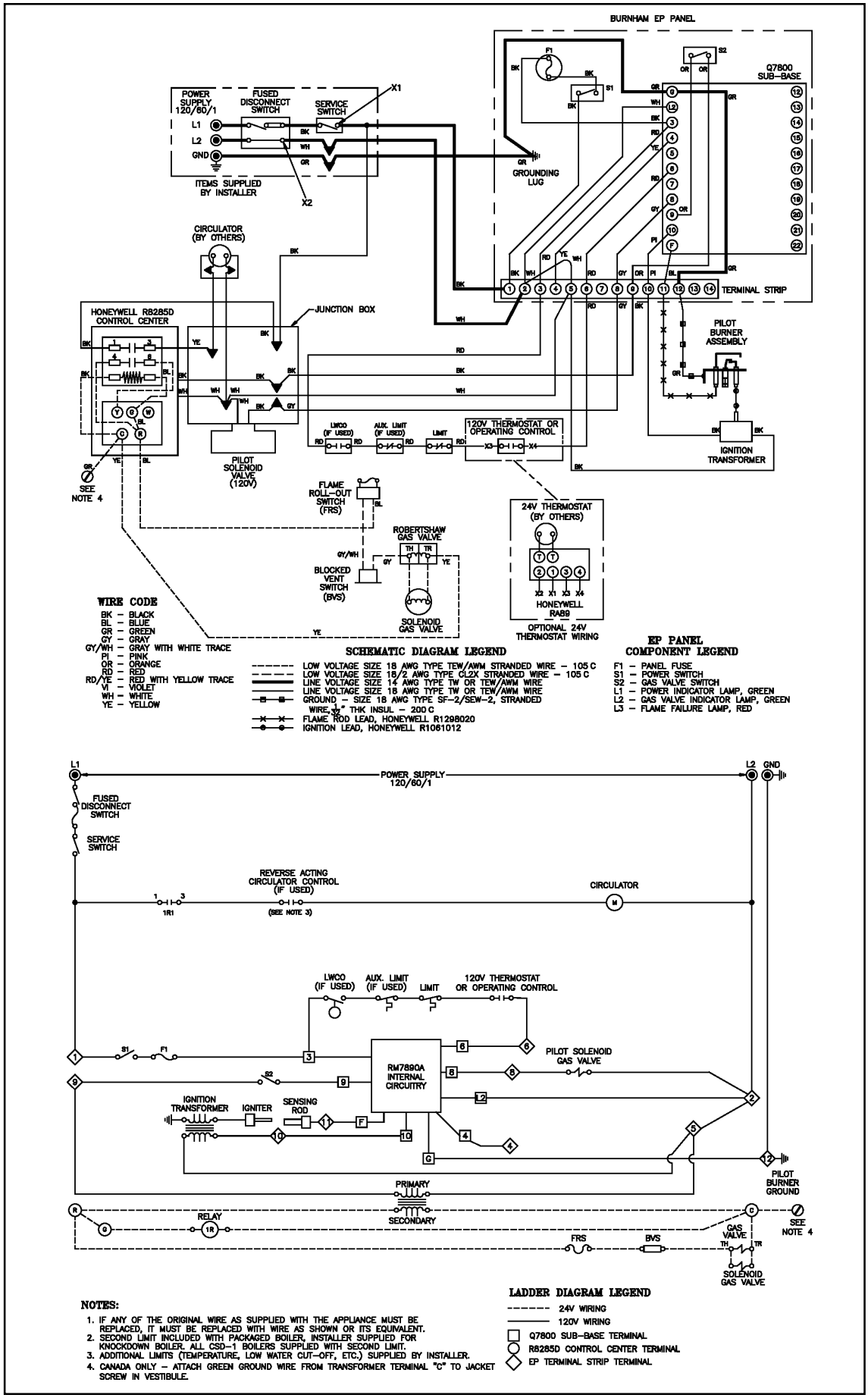

BURNHAM EP PANEL
Q7800 SUB-BASE
TERMINAL STRIP
POWER SUPPLY 120/60/1
FUSED DISCONNECT SWITCH
SERVICE SWITCH
ITEMS SUPPLIED BY INSTALLER
GROUNDING LUG
CIRCULATOR (BY OTHERS)
HONEYWELL R8285D CONTROL CENTER
JUNCTION BOX
PILOT SOLENOID VALVE (120V)
PILOT BURNER ASSEMBLY
IGNITION TRANSFORMER
LWCO (IF USED)
AUX. LIMIT (IF USED)
LIMIT
120V THERMOSTAT OR OPERATING CONTROL
FLAME ROLL-OUT SWITCH (FRS)
ROBERTSHAW GAS VALVE
BLOCKED VENT SWITCH (BVS)
SOLENOID GAS VALVE
24V THERMOSTAT (BY OTHERS)
HONEYWELL RA89
OPTIONAL 24V THERMOSTAT WIRING
SEE NOTE 4
WIRE CODE
BK - BLACK
BL - BLUE
GR - GREEN
GY - GRAY
GY/WH - GRAY WITH WHITE TRACE
PI - PINK
OR - ORANGE
RD - RED
RD/YE - RED WITH YELLOW TRACE
VI - VIOLET
WH - WHITE
YE - YELLOW
SCHEMATIC DIAGRAM LEGEND
LOW VOLTAGE SIZE 18 AWG TYPE TEW/AWM STRANDED WIRE - 105 C
LOW VOLTAGE SIZE 18/2 AWG TYPE CL2X STRANDED WIRE - 105 C
LINE VOLTAGE SIZE 14 AWG TYPE TW OR TEW/AWM WIRE
LINE VOLTAGE SIZE 18 AWG TYPE TW OR TEW/AWM WIRE
GROUND - SIZE 18 AWG TYPE SF-2/SEW-2, STRANDED WIRE, 1/32" THK INSUL - 200 C
FLAME ROD LEAD, HONEYWELL R1298020
IGNITION LEAD, HONEYWELL R1061012
EP PANEL COMPONENT LEGEND
F1 - PANEL FUSE
S1 - POWER SWITCH
S2 - GAS VALVE SWITCH
L1 - POWER INDICATOR LAMP, GREEN
L2 - GAS VALVE INDICATOR LAMP, GREEN
L3 - FLAME FAILURE LAMP, RED
L1
L2 GND
POWER SUPPLY 120/60/1
FUSED DISCONNECT SWITCH
SERVICE SWITCH
REVERSE ACTING CIRCULATOR CONTROL (IF USED)
(SEE NOTE 3)
CIRCULATOR
LWCO (IF USED)
AUX. LIMIT (IF USED)
LIMIT
120V THERMOSTAT OR OPERATING CONTROL
RM7890A INTERNAL CIRCUITRY
PILOT SOLENOID GAS VALVE
IGNITION TRANSFORMER
IGNITER
SENSING ROD
PRIMARY
SECONDARY
RELAY
PILOT BURNER GROUND
SEE NOTE 4
FRS
BVS
GAS VALVE
SOLENOID GAS VALVE
NOTES:
1. IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRE AS SHOWN OR ITS EQUIVALENT.
2. SECOND LIMIT INCLUDED WITH PACKAGED BOILER, INSTALLER SUPPLIED FOR KNOCKDOWN BOILER. ALL CSD-1 BOILERS SUPPLIED WITH SECOND LIMIT.
3. ADDITIONAL LIMITS (TEMPERATURE, LOW WATER CUT-OFF, ETC.) SUPPLIED BY INSTALLER.
4. CANADA ONLY - ATTACH GREEN GROUND WIRE FROM TRANSFORMER TERMINAL "C" TO JACKET SCREW IN VESTIBULE.
LADDER DIAGRAM LEGEND
24V WIRING
120V WIRING
Q7800 SUB-BASE TERMINAL
R8285D CONTROL CENTER TERMINAL
EP TERMINAL STRIP TERMINAL

Figure 44: Wiring Diagram, EP/EP-CSD-1 Ignition System, USA, Intermittent Circulation

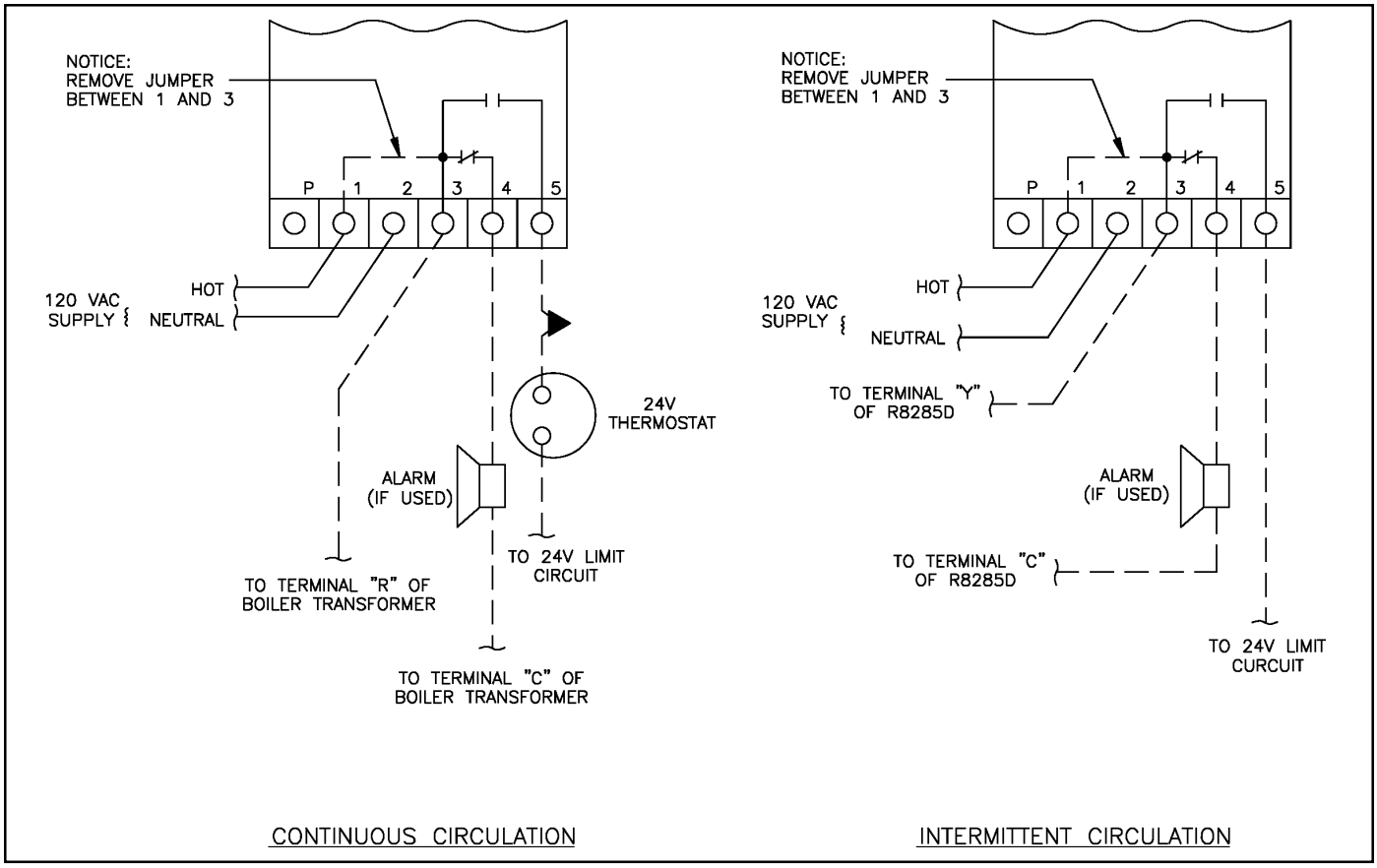


Figure 45: McDonnell & Miller PS-851 (120V) L.W.C.O. Wiring for Boilers with 24V Limit Circuits

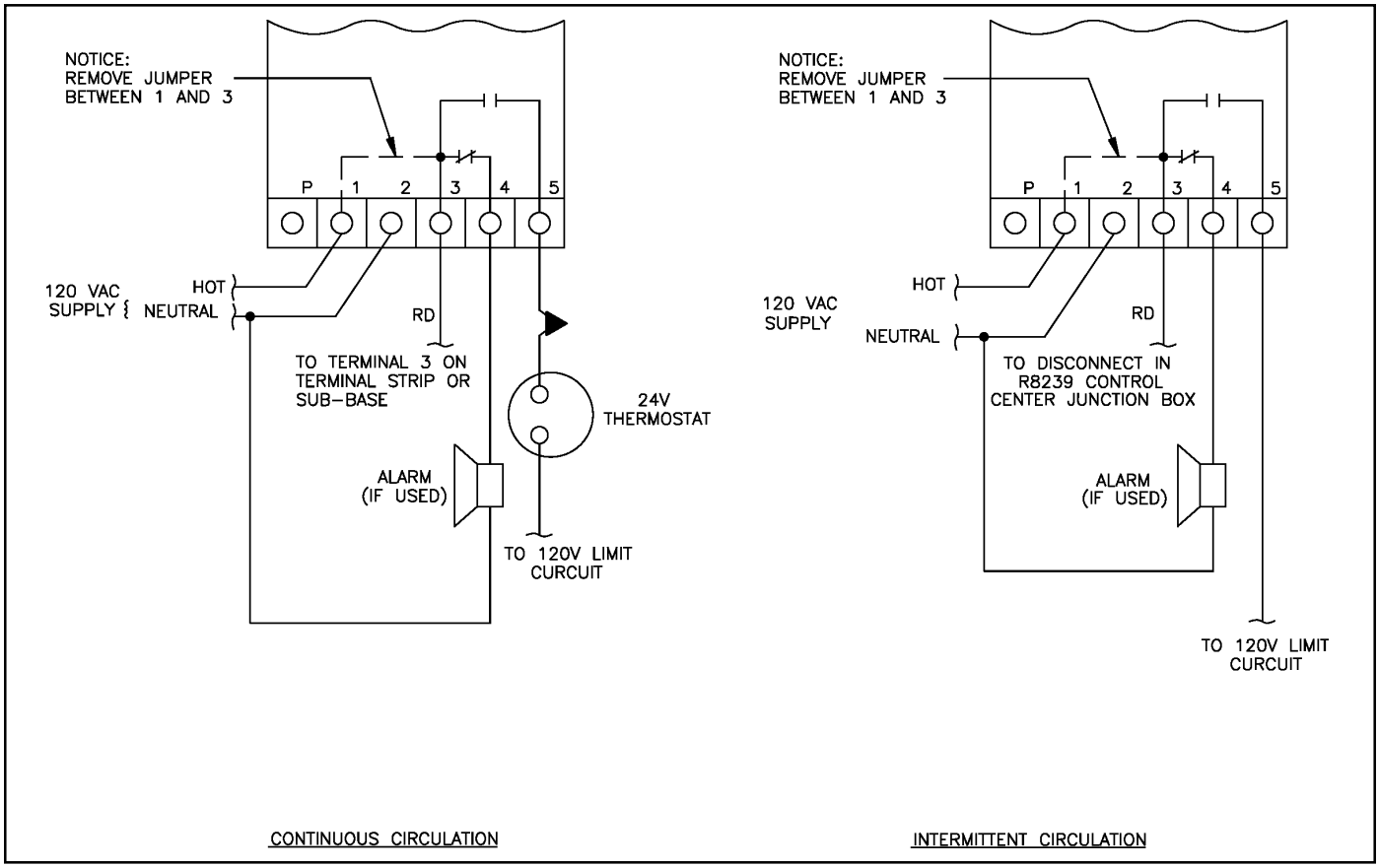


Figure 46: McDonnell & Miller PS-851 (120V) L.W.C.O. Wiring for Boilers with 120V Limit Circuits (OP & EP)

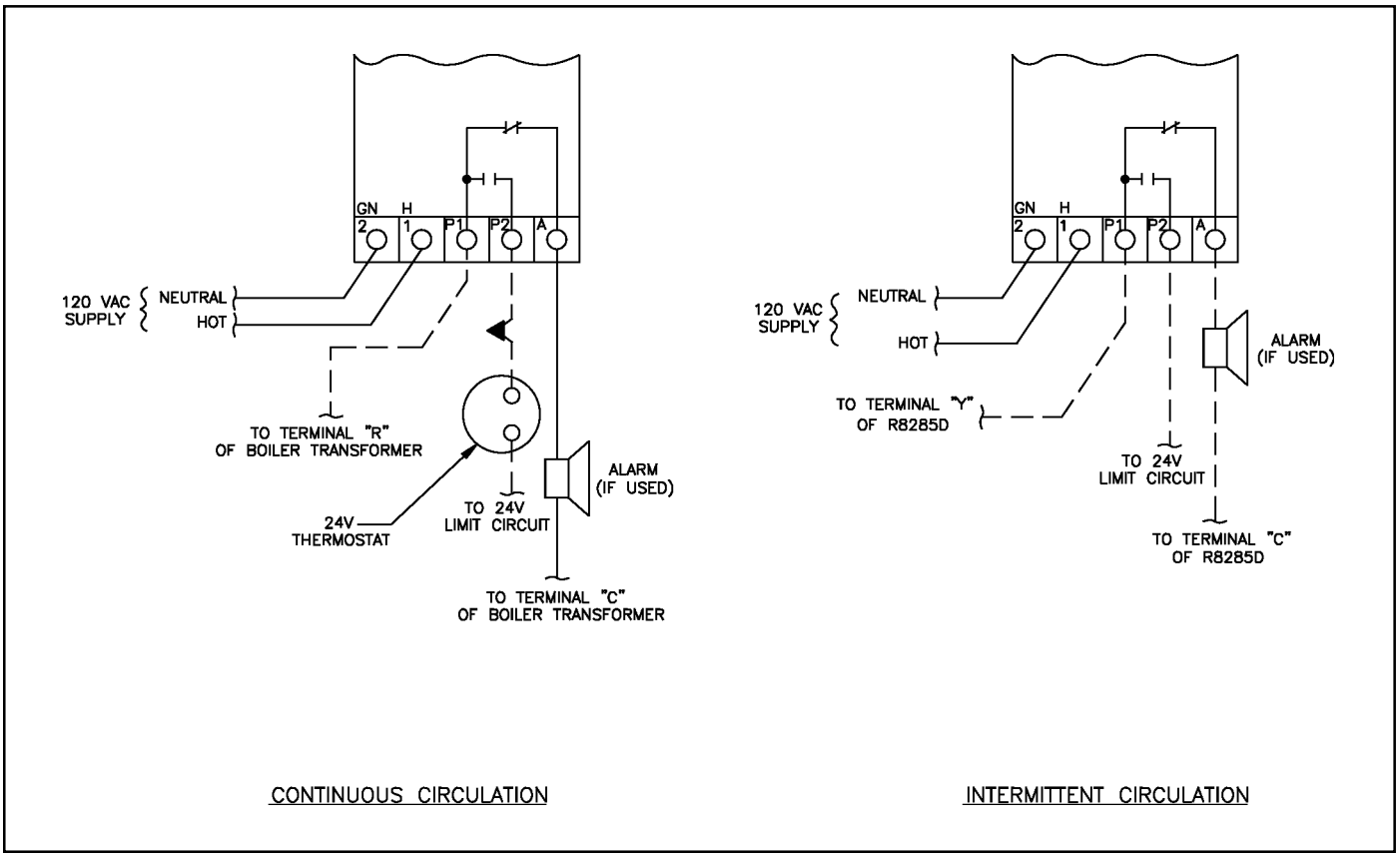


Figure 47: Hydrolevel OEM - 170/550/650/750 (120V) L.W.C.O. Wiring for Boilers with 24V Limit Circuits

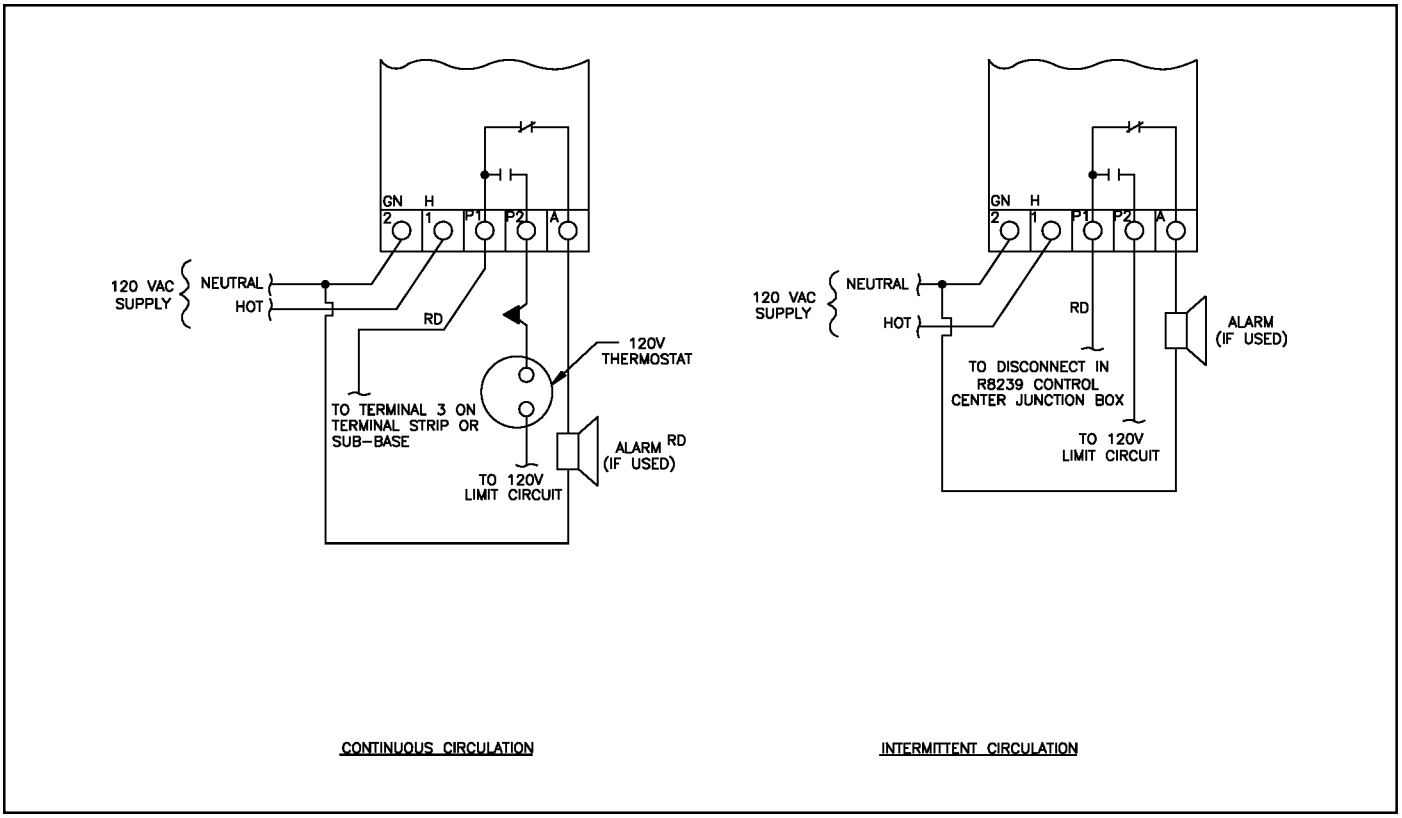


Figure 48: Hydrolevel OEM - 170/550/650/750 (120V) L.W.C.O. Wiring for Boilers with 120V Limit Circuits

WARNING

Completely read, understand and follow all instructions in this manual before attempting start up.

A. Safe operation and other performance criteria were met with the gas manifold and control assembly provided on boiler when boiler underwent tests specified in *American National Standard for Gas-Fired Low-Pressure Steam and Hot Water Boilers*, ANSI Z21.13.

B. Check Main Burners. Main burners must be properly located on support bracket in Base Rear Panel, seated on Main Burner Orifices, and secured with hitch pin clips.

C. Verify that the venting, water piping, gas piping and electrical system are installed properly. Refer to installation instructions contained in this manual.

D. Confirm all electrical, water and gas supplies are turned off at the source and that vent is clear of obstructions.

E. FILL ENTIRE HEATING SYSTEM WITH WATER and vent air from system. Use following procedure on a Series Loop or multi-zoned system installed as per Figure 25 to remove air from system when filling.

WARNING

The maximum operating pressure of this boiler is 50 psig. Never exceed this pressure. Do not plug or modify pressure relief valve.

1. Close full port ball valve in boiler supply piping.
2. Isolate all zones by closing zone valves or shut-off valves in supply and return of each zone(s).
3. Attach a hose to the vertical purge valve located prior to the full port ball valve in the system supply piping. (Note - Terminate hose in five gallon bucket at a suitable floor drain or outdoor area).
4. Starting with one circuit at a time, open zone valve or shut-off valve in system supply and return piping.
5. Open purge valve.
6. Open fill valve (Make-up water line should be located directly after full port ball valve in system supply piping between air scoop and expansion tank).
7. Allow water to overflow from bucket until discharge from hose is bubble free for 30 seconds.
8. Close the open zone valve or shut-off valve for the zone being purged of air, then open the zone valve or shut-off valve for the next zone to be purged. Repeat this step until all zones have been purged. At completion, open all zone valves or shut-off valves.
9. Close purge valve, continue filling the system until the pressure gauge reads the desired cold fill pressure. Close fill valve.
   (Note - If make-up water line is equipped with pressure reducing valve, adjust pressure reducing valve to desired cold fill pressure. Follow fill valve manufacturer's instructions).
10. Open isolation valve in boiler supply piping.
11. Remove hose from purge valve.

F. Confirm that the boiler and system have no water leaks.

G. Prepare to check operation.

1. Obtain gas heating value (in Btu per cubic foot) from gas supplier.
2. Connect manometer to pressure tap on gas valve. Use 1/8 NPT tapping provided.
3. Temporarily turn off all other gas-fired appliances.
4. Turn on gas supply to the boiler gas piping.
5. Confirm that the supply pressure to the gas valve is 14 in. w.c. or less.
6. Open the field installed manual gas shut-off valve located upstream of the gas valve on the boiler.
7. Using soap solution, or similar non-combustible solution, electronic leak detector or other approved method. Check that boiler gas piping, valves, and all other components are leak free. Eliminate any leaks.
8. Purge gas line of air.

DANGER

Do not use matches, candles, open flames or other ignition source to check for leaks.

H. Follow Lighting or Operating Instructions to place boiler in operation. Refer to label on inside of Front Removable Panel or appropriate Figure as listed in Table 11.

Table 11: Lighting and Operating Instructions

Ignition System	Lighting or Operating Instructions	Pilot Flame Illustration
Standing Pilot (24V)	Figure 49	Figure 54
Honeywell EI	Figure 50	Figure 55
Johnson EI		Figure 56
OP	Figure 51	Figure 57
EP	Figure 52	Figure 58
OP-CSD-1	Figure 53	Figure 57
EP-CSD-1		Figure 58

FOR YOUR SAFETY READ BEFORE LIGHTING

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury, or loss of life.

A. This appliance has a pilot which must be lighted by hand. When lighting the pilot, follow these instructions exactly.

B. BEFORE LIGHTING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS:

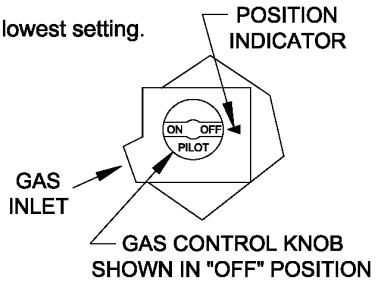
- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

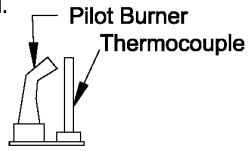
D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

LIGHTING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. Read the lighting instructions all the way through before starting the procedure.
3. If equipped with vent damper, set the room thermostat to highest setting and wait two (2) minutes for the damper to open.
4. Turn off all electric power to the appliance.
5. Set the room thermostat to lowest setting.
6. Remove front door.
7. Locate the gas control valve at the end of the gas supply pipe going into the boiler. The gas control knob is the gray or brown plastic knob located on top of the gas control valve.



8. Push in gas control knob slightly and turn clockwise to "OFF". NOTE: Knob cannot be turned from "PILOT" to "OFF" unless knob is pushed in slightly. Do not force.
9. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the safety information above on this label. If you do not smell gas, go to the next step. NOTE: Vent damper must be open during this five (5) minute wait period.
10. Remove burner access panel.
11. Find the pilot by following the aluminum tube from the gas control valve to the pilot located between the steel tube burners.



12. Turn gas control knob counterclockwise to "PILOT" position.
13. Push in control knob all the way and hold in. Immediately light the pilot with a match. Continue to hold the control knob for about one (1) minute after the pilot is lit. Release knob and it will pop back up. Pilot should remain lit. If it goes out, repeat steps 8-13.
    - If knob does not pop up when released, stop and immediately call your service technician or gas supplier.
    - If the pilot will not stay lit after several tries, turn gas control knob to "OFF" and call your service technician or gas supplier.
14. Replace burner access panel.
15. Turn gas control knob counterclockwise to "ON" position.
16. Replace front door.
17. Turn on all electric power to the appliance.
18. Set room thermostat to desired setting.

TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to the lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove front door.
4. Push in gas control knob slightly and turn clockwise to "OFF". Do not force.
5. Replace front door.

Figure 49: Lighting Instructions (24V Standing Pilot)

FOR YOUR SAFETY READ BEFORE OPERATING

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury, or loss of life.

A. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.

B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS:

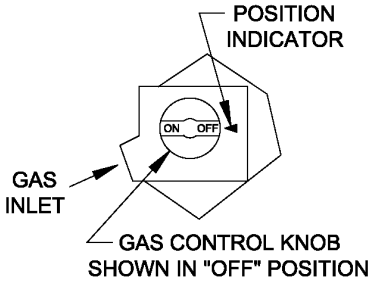
- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

C. Use only your hand to turn the gas control knob. Never use tools. If the knob will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
5. Remove front door.
6. Locate the gas control valve at the end of the gas supply pipe going into the boiler. The gas control knob is the gray or brown plastic knob located on top of the gas control valve.



7. Rotate gas control knob clockwise from "ON" position to "OFF". Make sure knob rests against stop.
8. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the safety information above on this label. If you do not smell gas, go to the next step.
9. Rotate gas control knob counterclockwise from "OFF" to "ON". Make sure knob rests against stop. Do not force.
10. Replace front door.
11. Turn on all electric power to the appliance.
12. Set thermostat to desired setting.
13. If the appliance will not operate, follow the instructions "TO TURN OFF GAS TO APPLIANCE" and call your service technician or gas supplier.

TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to the lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove front door.
4. Rotate gas control knob clockwise from "ON" position to "OFF". Make sure knob rests against stop.
5. Replace front door.

Figure 50: Operating Instructions (EI)

FOR YOUR SAFETY READ BEFORE LIGHTING

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury, or loss of life.

A. This appliance has a pilot which must be lighted by hand. When lighting the pilot, follow these instructions exactly.

B. BEFORE LIGHTING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS:

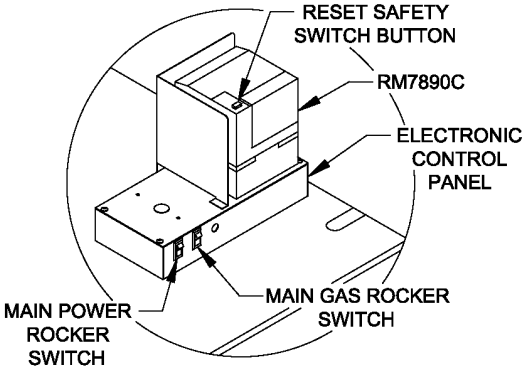
- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

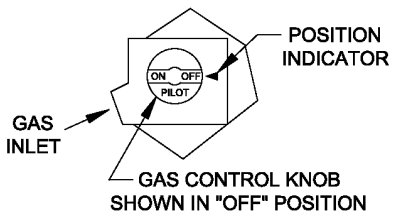
LIGHTING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. Read the lighting instructions all the way through before starting the procedure.
3. Set the room thermostat to lowest setting.
4. Turn off all electric power to the appliance.

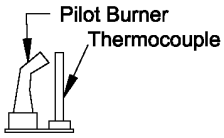


CONTROL LOCATION DIAGRAM

5. OP SYSTEM: Flip both rocker switches to "O" position (off).
6. Remove front door.
7. Locate the gas control valve at the end of the gas supply pipe going into the boiler. The gas control knob is the knob located on the top of the gas control valve (see diagram below).



8. Push in gas control knob slightly and turn clockwise ↷ to "OFF". NOTE: Knob cannot be turned from "PILOT" to "OFF" unless knob is pushed in slightly. Do not force.
9. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the safety information above on this label. If you do not smell gas, go to the next step.
10. Remove burner access panel.
11. Find the pilot by following the aluminum tube from the gas control valve to the pilot located between the steel tube burners.



12. Turn gas control knob counterclockwise ↶ to "PILOT" position.
13. Push in control knob all the way and hold in. Immediately light the pilot with a match. Continue to hold the control knob for about one (1) minute after the pilot is lit. Release knob and it will pop back up. Pilot should remain lit. If it goes out, repeat steps 8-13.
    - If knob does not pop up when released, stop and immediately call your service technician or gas supplier.
    - If the pilot will not stay lit after several tries, turn gas control knob to "OFF" and call your service technician or gas supplier.
14. Replace burner access panel.
15. OP SYSTEM
    - Turn on all electric power to the appliance.
    - Set the thermostat or operating control to desired setting.
    - See control location diagram. On the electronic control panel, flip the main power rocker switch to "I" position (on). The "POWER" status indicator will light. Turn gas control knob counterclockwise ↶ to "ON".
    - On the electronic control panel, flip the main gas valve rocker switch to "I" position (on). The "MAIN" gas valve status indicator will light. Main burners will operate. "MAIN" gas valve indicator will cycle on and off at the same time as the thermostat or operating control and the main burners.
    - If pilot failure occurs, the "ALARM" status indicator will light. Repeat steps 1 thru 16.
    - Replace the front door.
16. If the appliance will not operate, follow the instructions "TO TURN OFF GAS TO APPLIANCE" and call your service technician or gas supplier.

TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to the lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove front door.
4. Push in gas control knob slightly and turn clockwise ↷ to "OFF". Do not force.
5. Replace front door.

Figure 51: Lighting Instructions (OP)

FOR YOUR SAFETY READ BEFORE OPERATING

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury, or loss of life.

A. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.

B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS:

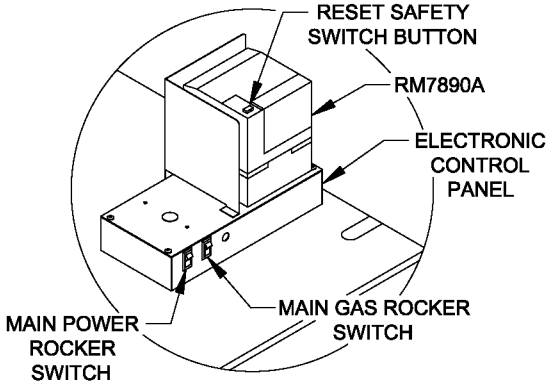
- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

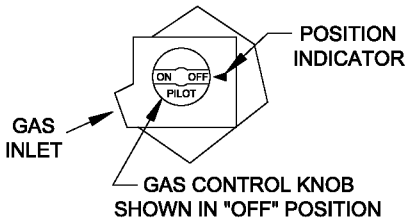
OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance.



CONTROL LOCATION DIAGRAM

4. EP SYSTEM: Flip both rocker switches to "O" position (off).
5. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
6. Remove front door.
7. Locate the gas control valve at the end of the gas supply pipe going into the boiler. The gas control knob is the knob located on top of the gas valve (see diagram to right).
8. Rotate gas control knob clockwise ↷ from "ON" position to "OFF". Make sure knob rests against stop.
9. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the safety information above on this label. If you do not smell gas, go to the next step.



10. EP SYSTEM
    - Turn gas control knob counterclockwise ↶ from "OFF" to "PILOT". When the proper position is reached the gas control knob will pop up.
    - Turn on all electric power to the appliance.
    - Set the thermostat or operating control to desired setting.
    - See control location diagram. On the electronic control panel, flip the main power rocker switch to "I" position (on). The "POWER" status indicator will light.
    - The pilot will light electronically. If pilot failure occurs, the "ALARM" indicator will light. In case of pilot failure, proceed to step 11.
    - Turn gas control knob counterclockwise ↶ to "ON".
    - On the electronic control panel, flip the main gas valve rocker switch to "I" position (on). The "MAIN" gas valve indicator will light. Main burners will operate. "MAIN" gas valve indicator will cycle on and off at the same time as the thermostat or operating control and the main burners.
    - Replace front door.
11. If the appliance will not operate, follow the instructions "TO TURN OFF GAS TO APPLIANCE" and call your service technician or gas supplier.

TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to the lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove front door.
4. Rotate gas control knob clockwise ↷ from "ON" position to "OFF". Make sure knob rests against stop.
5. Replace front door.

Figure 52: Operating Instructions (EP)

BOILER OPERATING INSTRUCTIONS

TO SHUT DOWN:

1. Close manual main shut-off valve(s) and pilot valve(s).
2. Turn off main electric switch.

TO START UP:

1. Make sure that both the main manual and the pilot valve(s) have been off for at least five minutes.
2. Turn room thermostat and all operating controls to lowest setting.
3. Remove burner access panel(s).
4. Open manual pilot valve(s).

NOTE:

Item (5) applies only to boilers with standing plot safety switch(es).

5. Depress button on standing pilot safety switch and hold lighted match to pilot, holding button in for at least one minute or until pilot remains lighted after button is released. Repeat for remaining standing pilots.
6. Turn on main electric switch.
7. Reset safety switch on flame safeguard relay.
8. Immediately light constant burning rectification pilot(s) Q179D with a lighted match. If pilot is not lighted in 15 seconds, Step (7) must be repeated. Electric pilot valve(s) are automatic, opening after Step (7). ("OP" System).

8a. Intermittent electric ignition rectification pilot(s) Q179C light up automatically when thermostat or operating control calls for heat. ("EP" System).

9. Replace burner access panel(s).
10. Open manual main shut-ff valve(s).
11. Adjust room thermostat and operating controls to desired setting.

Figure 53: Lighting / Operating Instructions (OP/EP-CSD-1)

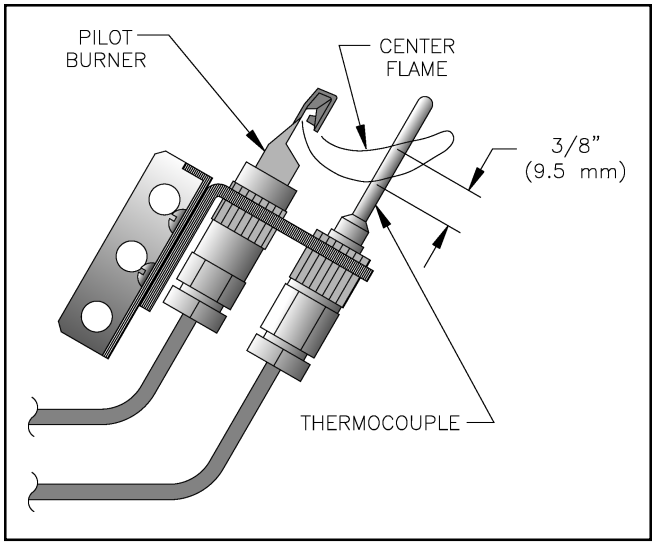


Figure 54: Honeywell Q314 Pilot Flame (24V Standing Pilot)

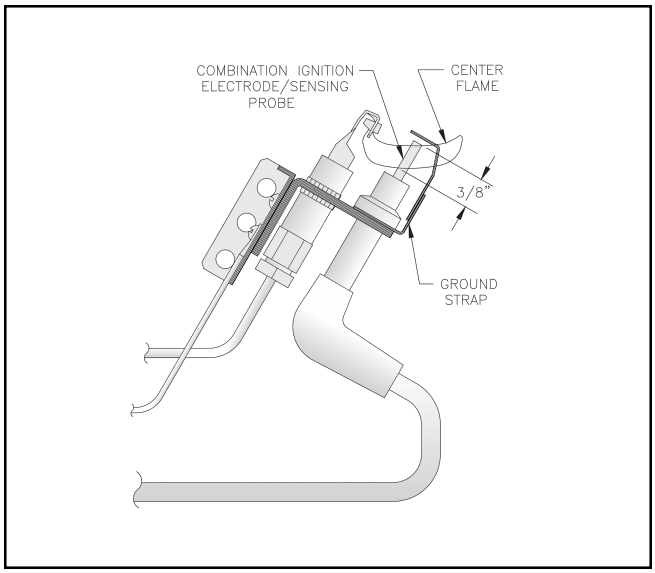


Figure 55: Honeywell Q348 Pilot Flame (24V Electronic Ignition)

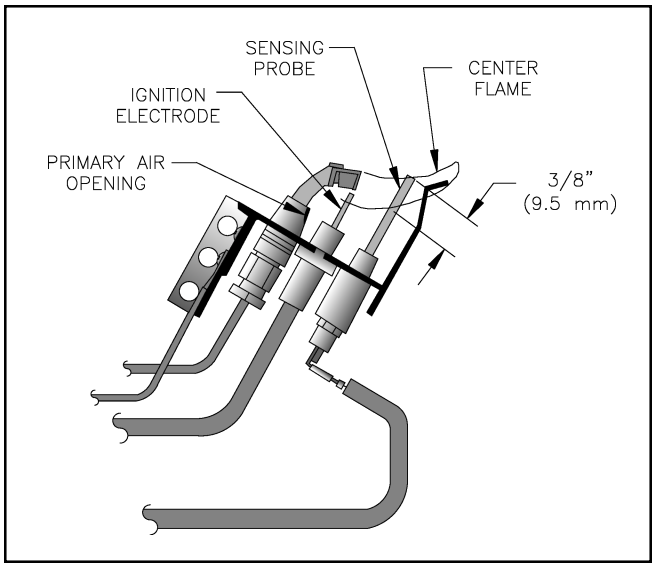


Figure 56: Johnson J991 Pilot Flame (24V Electronic Ignition)

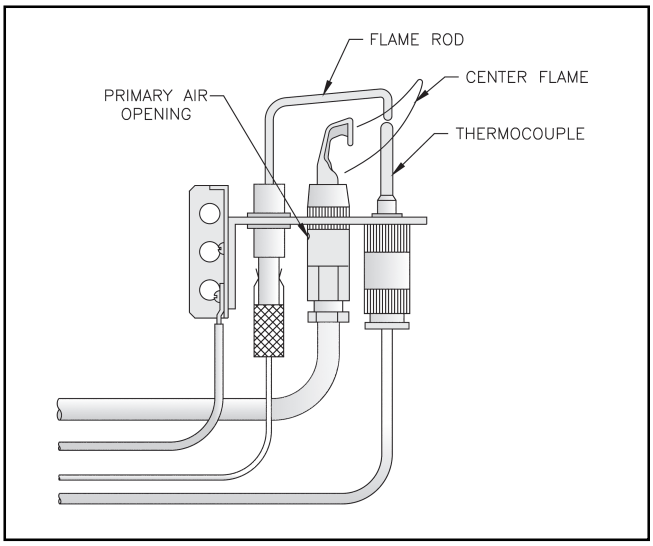


Figure 57: Honeywell Q179D Pilot Flame (OP)

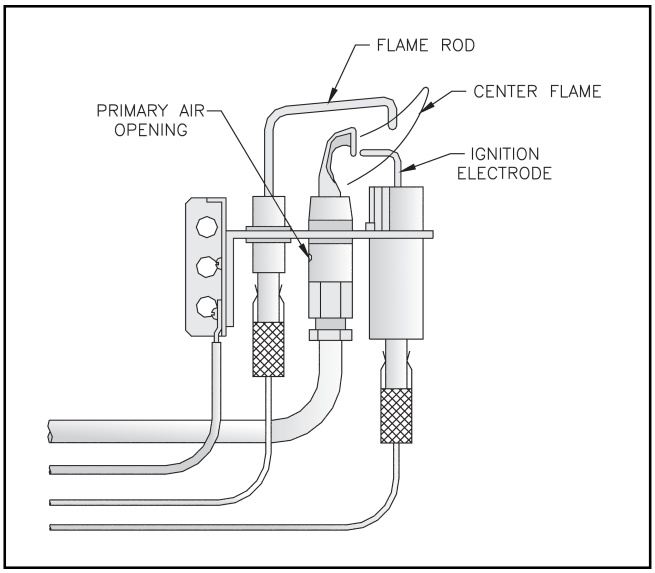


Figure 58: Honeywell Q179C Pilot Flame (EP)

I. Check pilot burner flame and main burner flames through observation port.

1. Check pilot flame. Refer to Table 11 for appropriate pilot detail.
2. Adjust thermostat to highest setting.
3. Check main burner flames. See Figure 59. Flame should have clearly defined inner cones with no yellow tipping. Orange-yellow streaks caused by dust should not be confused with true yellow tipping.

CAUTION

Avoid operating this boiler in an environment where saw dust, loose insulation fibers, dry wall dust, etc. are present. If boiler is operated under these conditions, the burner interior and ports must be cleaned and inspected daily to insure proper operation.

Yellow-tipping indicates lack of primary air. Improper burner alignment on Main Burner Orifice will also affect primary air injection. Adjust primary air as follows:

a. Loosen lock screw.

b. Close air adjustment until yellow tips appear on flames.

c. Slowly open air adjustment until clearly defined inner cones are visible.

d. Tighten lock screw.

4. Adjust thermostat to normal setting.

J. Check thermostat or operating control operation. Raise and lower temperature setting to start and stop boiler operation.

K. Check ignition system shut-off.

1. Standing Pilot (24V): Disconnect thermocouple lead at Gas Valve. Gas Valve must close and pilot and main burners extinguish. If not, replace the gas valve.
2. Honeywell EI: Disconnect ignitor/sensor cable from Terminal (9) of ignition module. Gas valve must close and pilot and main burners extinguish. If not, measure voltage across gas valve terminals "TH" and "TR".
   a. If voltage is not present, replace gas valve.
   b. If voltage is present, replace ignition module.
3. Johnson EI: Disconnect sensor cable from Terminal 4 (SENSE). Gas valve must close and pilot and main burner extinguish. If not, measure voltage across gas valve terminals "TH" and "TR".
   a. If voltage is not present, replace gas valve.
   b. If voltage is present, replace ignition module.
4. EP and OP: Refer to instructions supplied with the Honeywell RM7890 Burner Control.

L. Check Limit(s).

1. Adjust thermostat to highest setting.
2. Observe temperature gauge. When temperature exceeds limit set point main burners should extinguish.

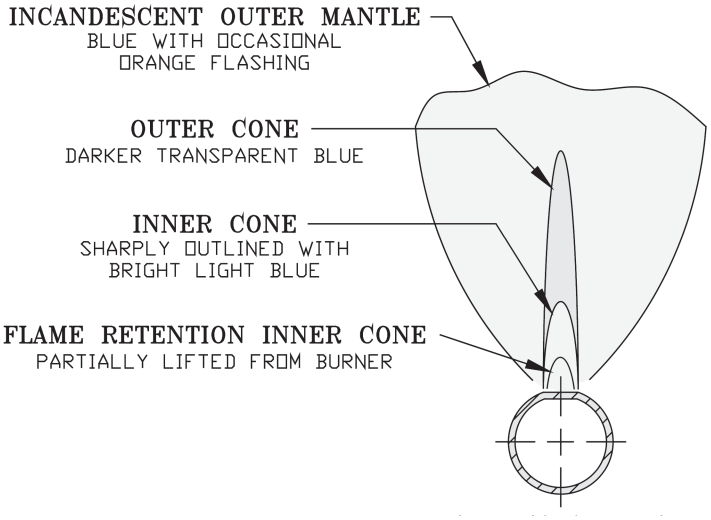


Figure 59: Main Burner Flame

3. Adjust limit to setting above observed reading. Main burners should reignite.
4. Adjust thermostat to lowest setting. Adjust limit to desired setting.

M. Adjust gas input rate to boiler. Natural Gas.

1. Adjust thermostat to highest setting.
2. Check manifold gas pressure. Manifold pressure is listed on rating label. Adjust gas valve pressure regulator as necessary (turn adjustment screw counterclockwise to decrease manifold pressure, or clockwise to increase manifold pressure). If pressure can not be attained, check gas valve inlet pressure. If less than minimum gas supply pressure listed on rating label, contact gas supplier for assistance.
3. Clock gas meter for at least 30 seconds. Use Table 12 to determine gas flow rate in Cubic Feet per Hour.
4. Determine Input Rate. Multiply gas flow rate by gas heating value.

WARNING

Failure to properly adjust gas input rate will result in over firing or under firing of the appliance. Improper and unsafe boiler operation may result.

5. Compare measured input rate to input rate stated on rating label.
   a. Boiler must not be overfired. Reduce input rate by decreasing manifold pressure. Do not reduce more than 0.3 inch w.c. If boiler is still overfired, contact your Burnham distributor or Regional Office for replacement Gas Orifices.

b. Increase input rate if less than 98% of rating plate input. Increase manifold gas pressure no more than 0.3 inch w.c. If measured input rate is still less than 98% of rated input:

i. Remove Main Burners per procedure in Section IX: Service.

ii. Remove gas orifices. Drill one (1) drill size larger (drill size is stamped on orifice, or see Key No. 4E).

iii. Reinstall gas orifices and main burners. Measure input rate.

6. Recheck Main Burner Flame.
7. Return other gas-fired appliances to previous conditions of use.

N. Adjust gas input rate to boiler. LP/Propane.

1. Set thermostat to highest setting.
2. Adjust tank regulator for gas valve inlet pressure of 13.5 inches w.c. or less.
3. Gas valve has step opening regulator which initially opens to 1.4 or 2.5 inch w.c. and steps to full pressure after approximately 30 seconds. Check manifold pressure after step has occurred. Adjust gas valve pressure regulator as necessary for 10.0 inches w.c. (turn adjustment screw counterclockwise to decrease manifold pressure, or clockwise to increase manifold pressure). If 10.0 inches w.c. can not be attained, check gas valve inlet pressure. If less than 11.0 inches w.c., contact gas supplier for assistance.

O. Clean Heating System

Oil, grease, and other foreign materials which accumulate in new hot water boilers and a new or reworked system should be boiled out, and then thoroughly flushed. A qualified water treatment chemical specialist should be consulted for recommendations regarding appropriate chemical compounds and concentrations which are compatible with local environmental regulations.

P. Check Damper Operation - If boiler is equipped with vent damper, vent damper must be in open position when boiler main burners are operating. Start boiler, refer to instructions on damper to determine if damper is in full open position.

Q. Install Front Removable Panel.

1. Engage top flange (longer of 2 flanges) behind Upper Front Panel.
2. Swing lower portion of door toward boiler.
3. Lower door to engage bottom flange behind Lower Front Tie Bar.

Table 12: Input Rate

Seconds for One Revolution	Size of Gas Meter Dial			
	One-Half Cu. Ft.	One Cu. Ft.	Two Cu. Ft.	Five Cu. Ft.
30	60	120	240	600
32	56	113	225	563
34	53	106	212	529
36	50	100	200	500
38	47	95	189	474
40	45	90	180	450
42	43	86	172	430
44	41	82	164	410
46	39	78	157	391
48	37	75	150	375
50	36	72	144	360
52	35	69	138	346
54	33	67	133	333
56	32	64	129	321
58	31	62	124	310
60	30	60	120	300
62	29	58	116	290
64	29	56	112	281
66	29	54	109	273
68	28	53	106	265
70	26	51	103	257
72	25	50	100	250
74	24	48	97	243
76	24	47	95	237
78	23	46	92	231
80	22	45	90	225

R. Combustion Chamber Burn-Off

1. The mineral wool combustion chamber panels contain a cornstarch based binder that must be burned out at installation to prevent odors during subsequent boiler operation.
2. Ventilate the boiler room, set the high limit to its maximum setting, set the thermostat to call for heat.
3. Allow the boiler to fire for at least an hour or until the odor from the cornstarch has dissipated.
4. Return the high limit and thermostat to their desired settings.

S. Review User's Information Manual and system operation with owner or operator.

IX. Service

WARNING

Service on this boiler should be undertaken only by trained and skilled personnel from a qualified service agency. Inspections should be performed at intervals specified in this manual. Maintain manual in a legible condition.

Keep boiler area clear and free of combustible materials, gasoline and other flammable vapors and liquids.

Do not place any obstructions in boiler room that will hinder flow of combustion and ventilation air.

The service instructions contained in this manual are in addition to the instructions provided by the manufacturer of the boiler components. Follow component manufacturer's instructions. Component manufacturer's instructions were provided with the boiler. Contact component manufacturer for replacement if instructions are missing. Do not install, start up, operate, maintain or service this boiler without reading and understanding all of the component instructions. Do not allow the boiler to operate with altered, disconnected or jumpered components. Only use replacement components identical to those originally supplied by Burnham.

A. General. Inspection and service must be conducted annually. Turn off electrical power and gas supply while conducting service or maintenance. Follow instructions TO TURN OFF GAS TO APPLIANCE. See Lighting/Operating Instructions on inside of Front Removable Door.

WARNING

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

B. Maintenance of Low Water Cut-off (if used). Follow instructions provided with low water cut-off.

C. Vent System. Check for:

1. obstructions
2. accumulations of soot
3. deterioration of vent pipe or vent accessories due to condensation or other reasons
4. proper support—no sags, particularly in horizontal runs
5. tightness of joints. Remove all accumulations of soot with wire brush and vacuum

Remove all obstructions. Replace all deteriorated parts and support properly. Seal all joints.

D. Remove Main Burners for cleaning, changing orifice plugs, or repairs.

1. Shut down gas boiler in accordance with Lighting/ Operating Instructions on inside of Front Removable Door. Close Manual Shut-off Valve.
2. Remove Front Removable Door. Raise Lower Front Tie Bar.
3. Disconnect ignition system.
4. Remove burner access panel(s).
5. Mark location of Main Burner with Pilot Bracket on manifold.
6. Remove hitch pin clips from Main Burner Orifices.
7. Hold Main Burner on throat. Lift slightly to raise rear of burner. Push to rear of boiler until burner clears Main Burner Orifice. Lift burners out.
8. Check burners to be sure they do not contain foreign matter or restrictions. Clean burners with a soft bristle brush, blow any dirt out with compressed air or use a vacuum cleaner. See Figure 60.

E. Clean Boiler Flueways.

1. Shut down gas boiler in accordance with Lighting/ Operating Instructions on inside of Front Removable Door. Close Manual Shut-off Valve.
2. Disconnect vent system. Remove Draft Hood.
3. Remove Jacket Top Panel.
4. Remove Canopy from top of boiler.
5. Thoroughly clean flueways with flue brush, removing all scale and soot. See Figure 60.
6. Clean boiler heating surface accessible from combustion chamber with straight handle wire brush.
7. Install Canopy. See Section II: Boiler Assembly, Paragraph G.
8. Install Jacket Top Panel, Draft Hood, Vent Damper (if used) and Vent System.

Important Product Safety Information
Refractory Ceramic Fiber Product

Warning:

This product contains refractory ceramic fibers (RCF). RCF has been classified as a possible human carcinogen. After this product is fired, RCF may, when exposed to extremely high temperature (>1800F), change into a known human carcinogen. When disturbed as a result of servicing or repair, RCF becomes airborne and, if inhaled, may be hazardous to your health.

AVOID Breathing Fiber Particulates and Dust

Precautionary Measures:

Do not remove or replace previously fired RCF (combustion chamber insulation, target walls, canopy gasket, flue cover gasket, etc.) or attempt any service or repair work involving RCF without wearing the following protective gear:

1. A National Institute for Occupational Safety and Health (NIOSH) approved respirator
2. Long sleeved, loose fitting clothing
3. Gloves
4. Eye Protection

- Take steps to assure adequate ventilation.
- Wash all exposed body areas gently with soap and water after contact.
- Wash work clothes separately from other laundry and rinse washing machine after use to avoid contaminating other clothes.
- Discard used RCF components by sealing in an air tight plastic bag.

First Aid Procedures:

- If contact with eyes: Flush with water for at least 15 minutes. Seek immediate medical attention if irritation persists.
- If contact with skin: Wash affected area gently with soap and water. Seek immediate medical attention if irritation persists.
- If breathing difficulty develops: Leave the area and move to a location with clean fresh air. Seek immediate medical attention if breathing difficulties persist.
- Ingestion: Do not induce vomiting. Drink plenty of water. Seek immediate medical attention.

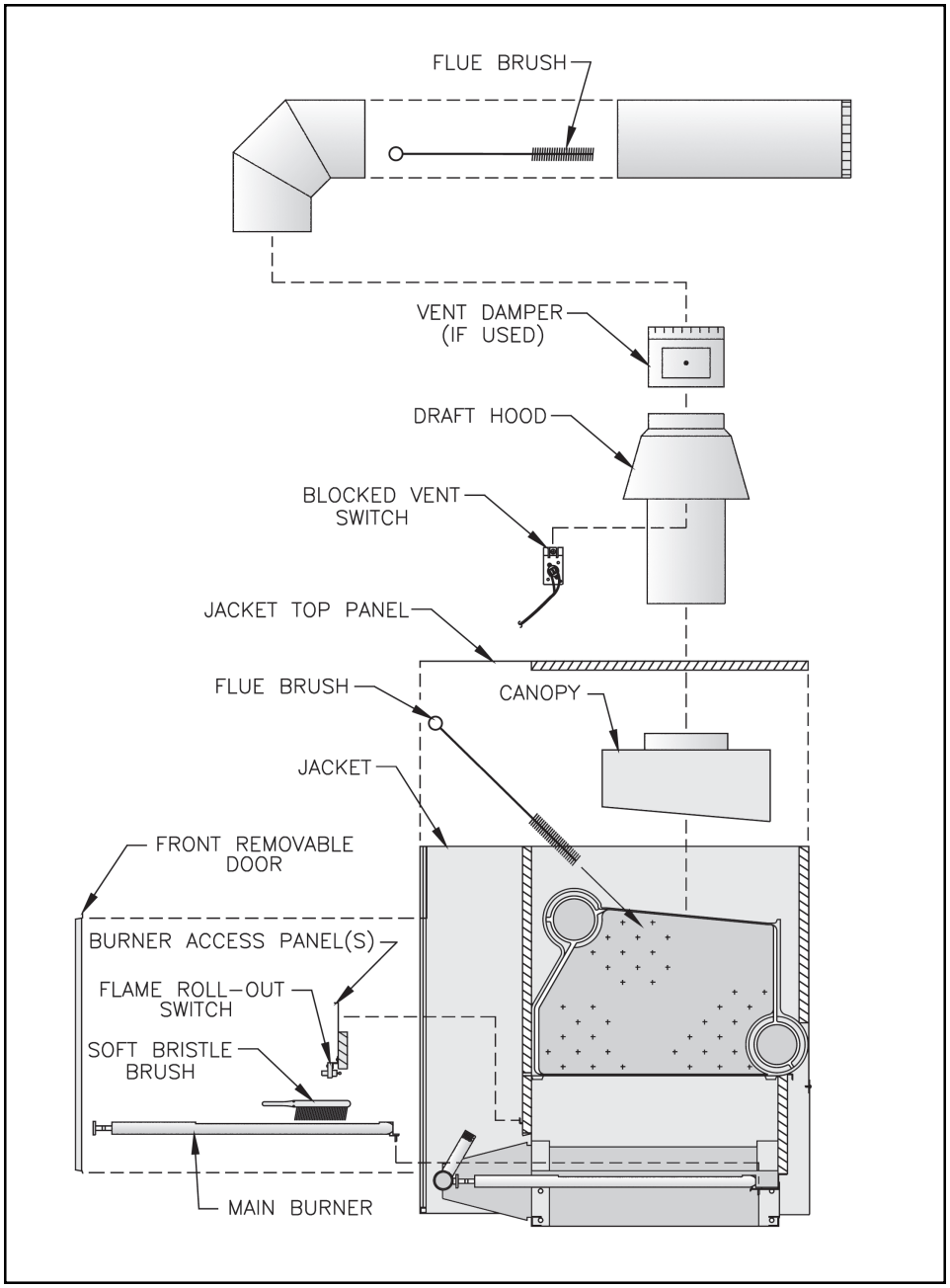


Figure 60: Boiler Flueway Cleaning

F. **Clean Combustion Chamber** by vacuuming. Exercise care to avoid damaging Base Insulation.

G. **Install Burners** by reversing procedures used to remove burners. Verify Main Burners are properly located on support bracket in Base Rear Panel, seated on Main Burner Orifices, and secured with hitch pin clips. Verify Main Burner with Pilot Bracket is in proper location. See Table 13.

H. **Lubrication.** Manufacturers Instruction should be followed on all parts installed on boiler requiring lubrication. This includes type of lubricant to be used, frequency of lubrication, and points to lubricate.

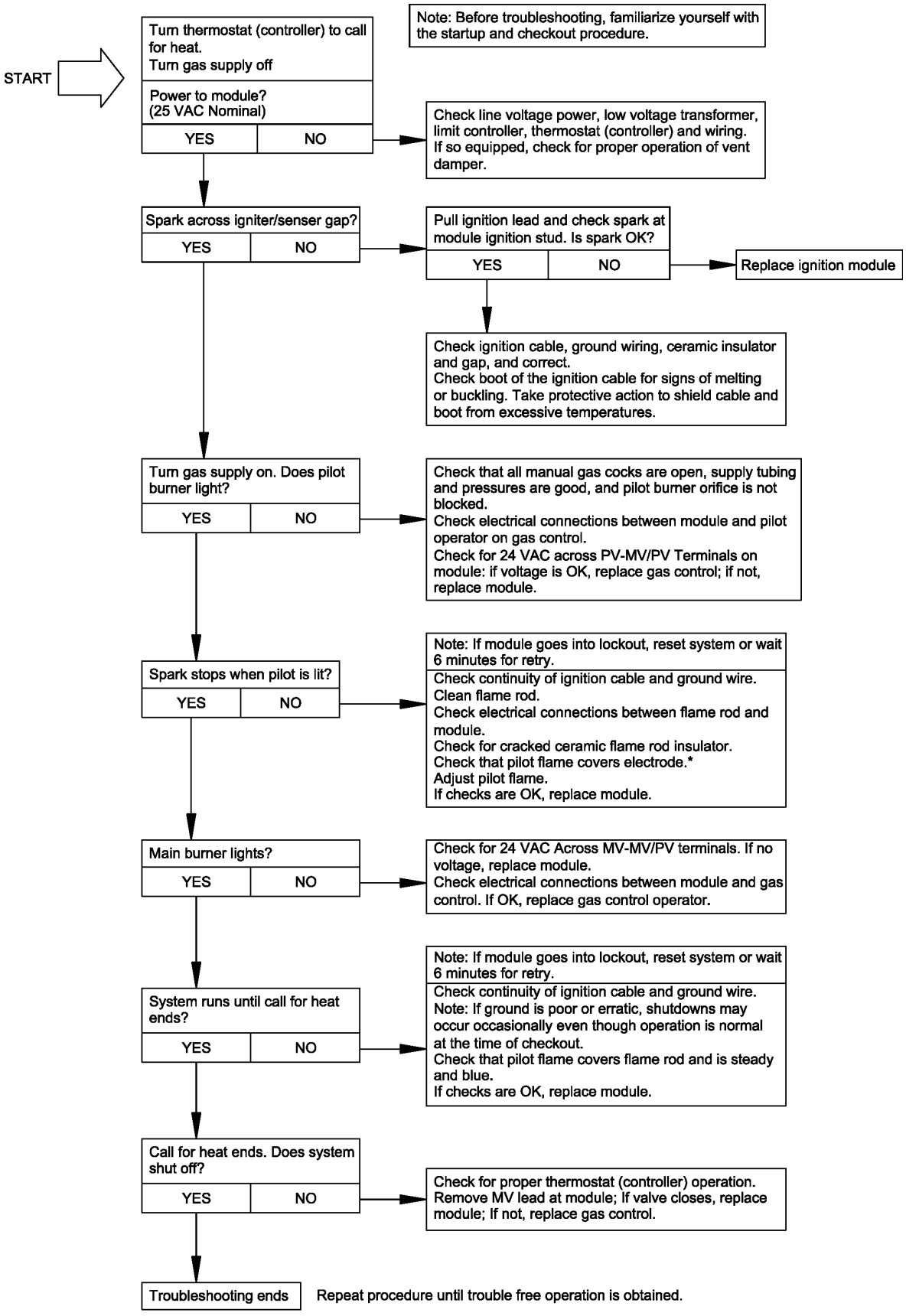
I. **Check operation.** Refer to Section VIII: System Start-up.

Table 13: Pilot Burner Location

Boiler Model No.	Pilot Located Between Burners*
805B	4 & 5
806B	5 & 6
807B	6 & 7
808B	6 & 7
809B	6 & 7
810B	7 & 8

* Burners numbered left to right as viewed from front of boiler.

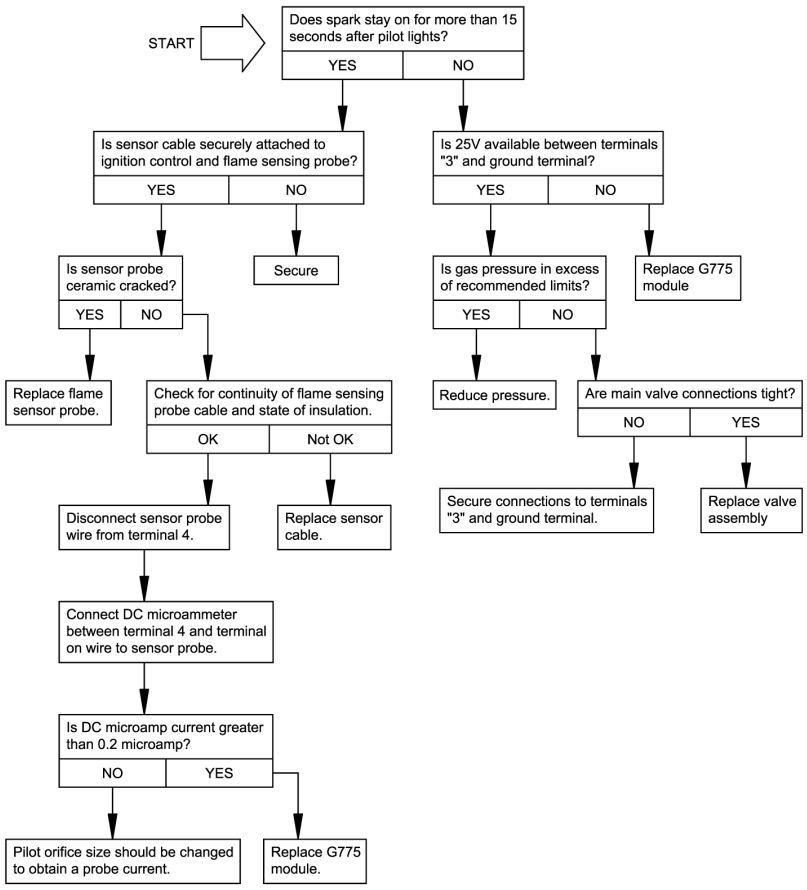
Honeywell EI Trouble Shooting Guide


START
Turn thermostat (controller) to call for heat.
Turn gas supply off
Note: Before troubleshooting, familiarize yourself with the startup and checkout procedure.
Power to module? (25 VAC Nominal)
YES
NO
Check line voltage power, low voltage transformer, limit controller, thermostat (controller) and wiring. If so equipped, check for proper operation of vent damper.
Spark across igniter/senser gap?
YES
NO
Pull ignition lead and check spark at module ignition stud. Is spark OK?
YES
NO
Replace ignition module
Check ignition cable, ground wiring, ceramic insulator and gap, and correct.
Check boot of the ignition cable for signs of melting or buckling. Take protective action to shield cable and boot from excessive temperatures.
Turn gas supply on. Does pilot burner light?
YES
NO
Check that all manual gas cocks are open, supply tubing and pressures are good, and pilot burner orifice is not blocked.
Check electrical connections between module and pilot operator on gas control.
Check for 24 VAC across PV-MV/PV Terminals on module: if voltage is OK, replace gas control; if not, replace module.
Spark stops when pilot is lit?
YES
NO
Note: If module goes into lockout, reset system or wait 6 minutes for retry.
Check continuity of ignition cable and ground wire.
Clean flame rod.
Check electrical connections between flame rod and module.
Check for cracked ceramic flame rod insulator.
Check that pilot flame covers electrode.*
Adjust pilot flame.
If checks are OK, replace module.
Main burner lights?
YES
NO
Check for 24 VAC Across MV-MV/PV terminals. If no voltage, replace module.
Check electrical connections between module and gas control. If OK, replace gas control operator.
System runs until call for heat ends?
YES
NO
Note: If module goes into lockout, reset system or wait 6 minutes for retry.
Check continuity of ignition cable and ground wire.
Note: If ground is poor or erratic, shutdowns may occur occasionally even though operation is normal at the time of checkout.
Check that pilot flame covers flame rod and is steady and blue.
If checks are OK, replace module.
Call for heat ends. Does system shut off?
YES
NO
Check for proper thermostat (controller) operation.
Remove MV lead at module; If valve closes, replace module; If not, replace gas control.
Troubleshooting ends
Repeat procedure until trouble free operation is obtained.

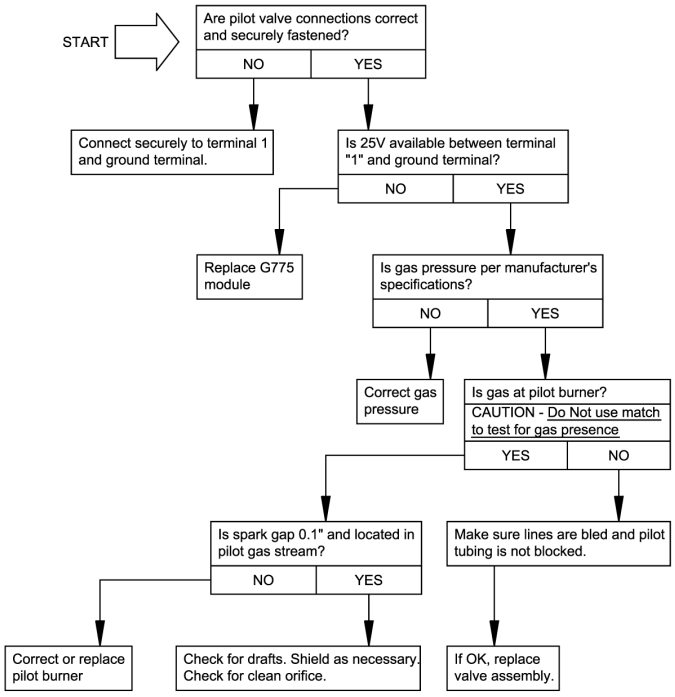
* Minimum pilot signal should be 1.0 microamps. Disconnect pilot ground wire from module and connect DC microammeter between ground terminal and pilot ground wire.

Johnson EI Trouble Shooting Guide

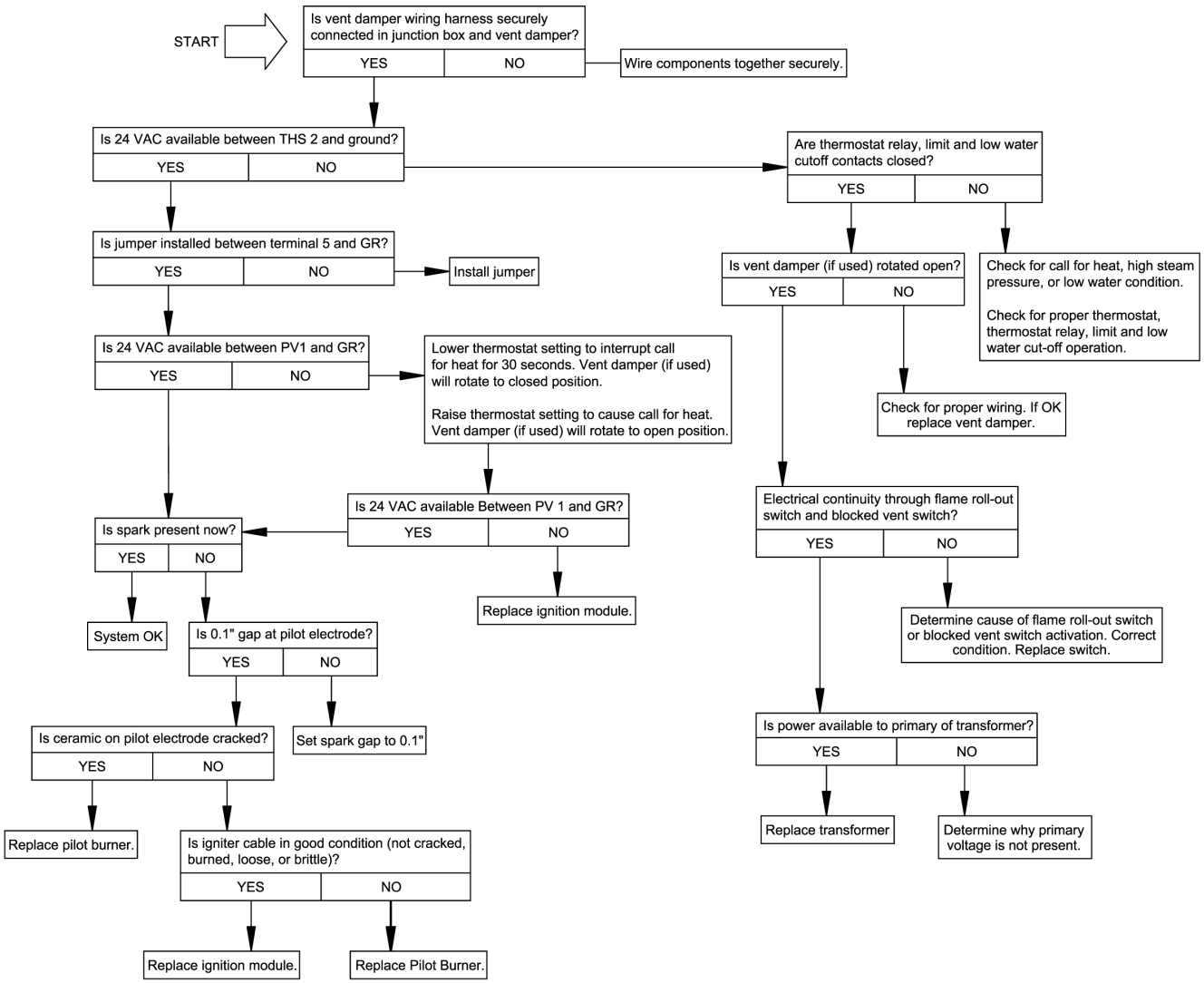
SITUATION A - PILOT LIGHTS BUT MAIN VALVE WILL NOT COME ON


START
Does spark stay on for more than 15 seconds after pilot lights?
YES
NO
Is sensor cable securely attached to ignition control and flame sensing probe?
YES
NO
Secure
Is sensor probe ceramic cracked?
YES
NO
Replace flame sensor probe.
Check for continuity of flame sensing probe cable and state of insulation.
OK
Not OK
Replace sensor cable.
Disconnect sensor probe wire from terminal 4.
Connect DC microammeter between terminal 4 and terminal on wire to sensor probe.
Is DC microamp current greater than 0.2 microamp?
NO
YES
Pilot orifice size should be changed to obtain a probe current.
Replace G775 module.
Is 25V available between terminals "3" and ground terminal?
YES
NO
Replace G775 module
Is gas pressure in excess of recommended limits?
YES
NO
Reduce pressure.
Are main valve connections tight?
NO
YES
Secure connections to terminals "3" and ground terminal.
Replace valve assembly

SITUATION B - WHEN BOILER IS RESET, SPARK IS PRESENT BUT PILOT WILL NOT LIGHT


START
Are pilot valve connections correct and securely fastened?
NO
YES
Connect securely to terminal 1 and ground terminal.
Is 25V available between terminal "1" and ground terminal?
NO
YES
Replace G775 module
Is gas pressure per manufacturer's specifications?
NO
YES
Correct gas pressure
Is gas at pilot burner?
CAUTION - Do Not use match to test for gas presence
YES
NO
Is spark gap 0.1" and located in pilot gas stream?
NO
YES
Correct or replace pilot burner
Check for drafts. Shield as necessary. Check for clean orifice.
Make sure lines are bled and pilot tubing is not blocked.
If OK, replace valve assembly.

SITUATION C - NO SPARK


START
Is vent damper wiring harness securely connected in junction box and vent damper?
YES
NO
Wire components together securely.
Is 24 VAC available between THS 2 and ground?
YES
NO
Are thermostat relay, limit and low water cutoff contacts closed?
YES
NO
Is jumper installed between terminal 5 and GR?
YES
NO
Install jumper
Is vent damper (if used) rotated open?
YES
NO
Check for call for heat, high steam pressure, or low water condition.
Check for proper thermostat, thermostat relay, limit and low water cut-off operation.
Is 24 VAC available between PV1 and GR?
YES
NO
Lower thermostat setting to interrupt call for heat for 30 seconds. Vent damper (if used) will rotate to closed position.
Raise thermostat setting to cause call for heat. Vent damper (if used) will rotate to open position.
Check for proper wiring. If OK replace vent damper.
Is 24 VAC available Between PV 1 and GR?
YES
NO
Electrical continuity through flame roll-out switch and blocked vent switch?
YES
NO
Is spark present now?
YES
NO
Replace ignition module.
Determine cause of flame roll-out switch or blocked vent switch activation. Correct condition. Replace switch.
System OK
Is 0.1" gap at pilot electrode?
YES
NO
Is power available to primary of transformer?
YES
NO
Is ceramic on pilot electrode cracked?
YES
NO
Set spark gap to 0.1"
Replace transformer
Determine why primary voltage is not present.
Replace pilot burner.
Is igniter cable in good condition (not cracked, burned, loose, or brittle)?
YES
NO
Replace ignition module.
Replace Pilot Burner.

SERVICE RECORD

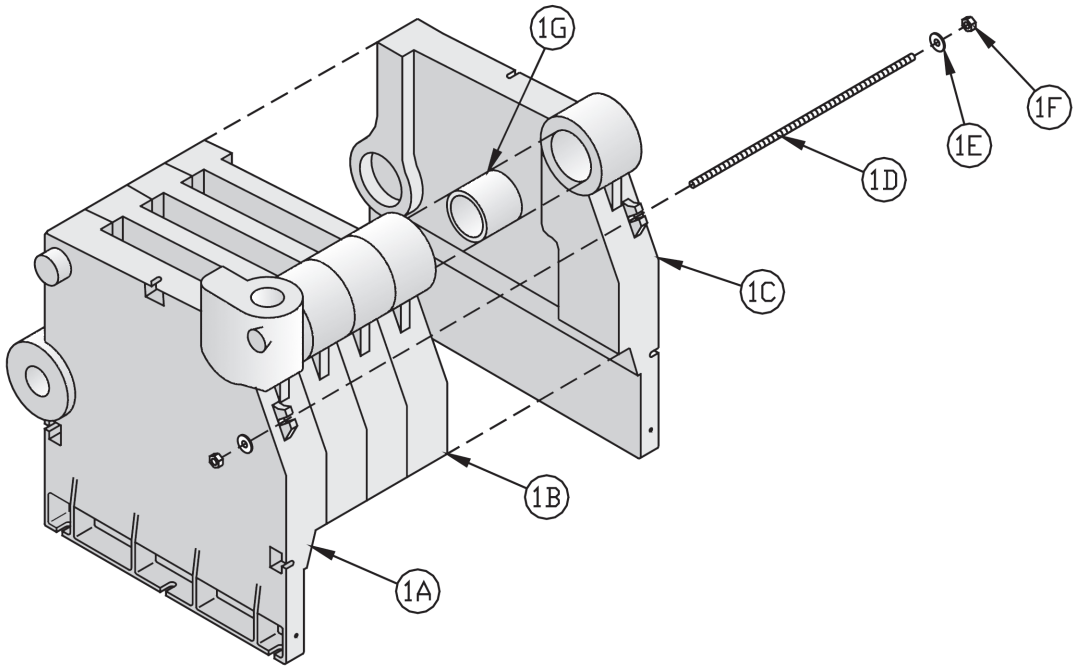
DATE SERVICE PERFORMED

SERVICE RECORD

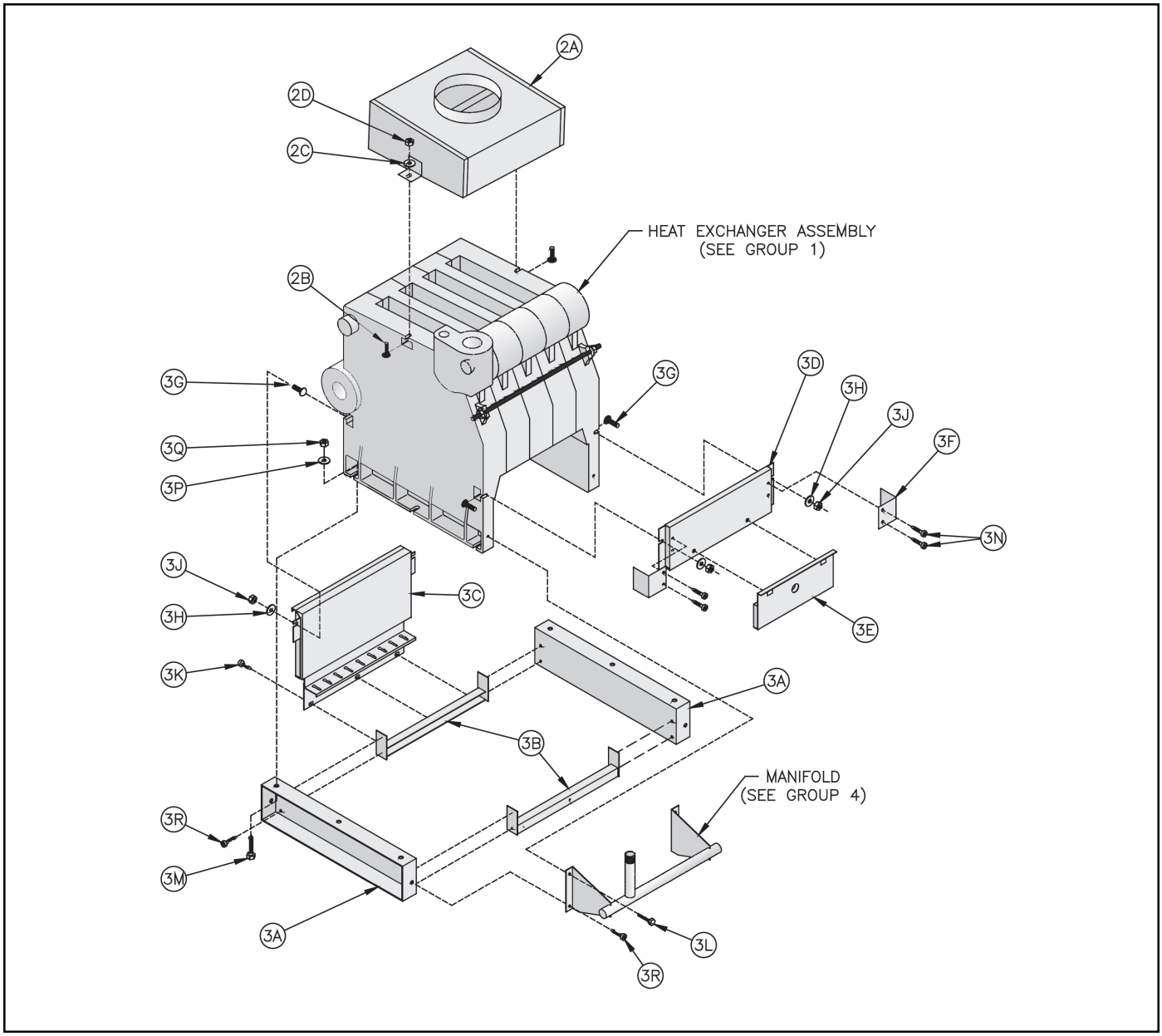
DATE SERVICE PERFORMED

X. Repair Parts

All Series 8B Repair Parts may be obtained through your local Burnham Wholesale distributor. Should you require assistance in locating a Burnham Distributor in your area, or have questions regarding the availability of Burnham products or repair parts, please contact Burnham Customer Service at (717) 481-8400 or Fax (717) 481-8408.



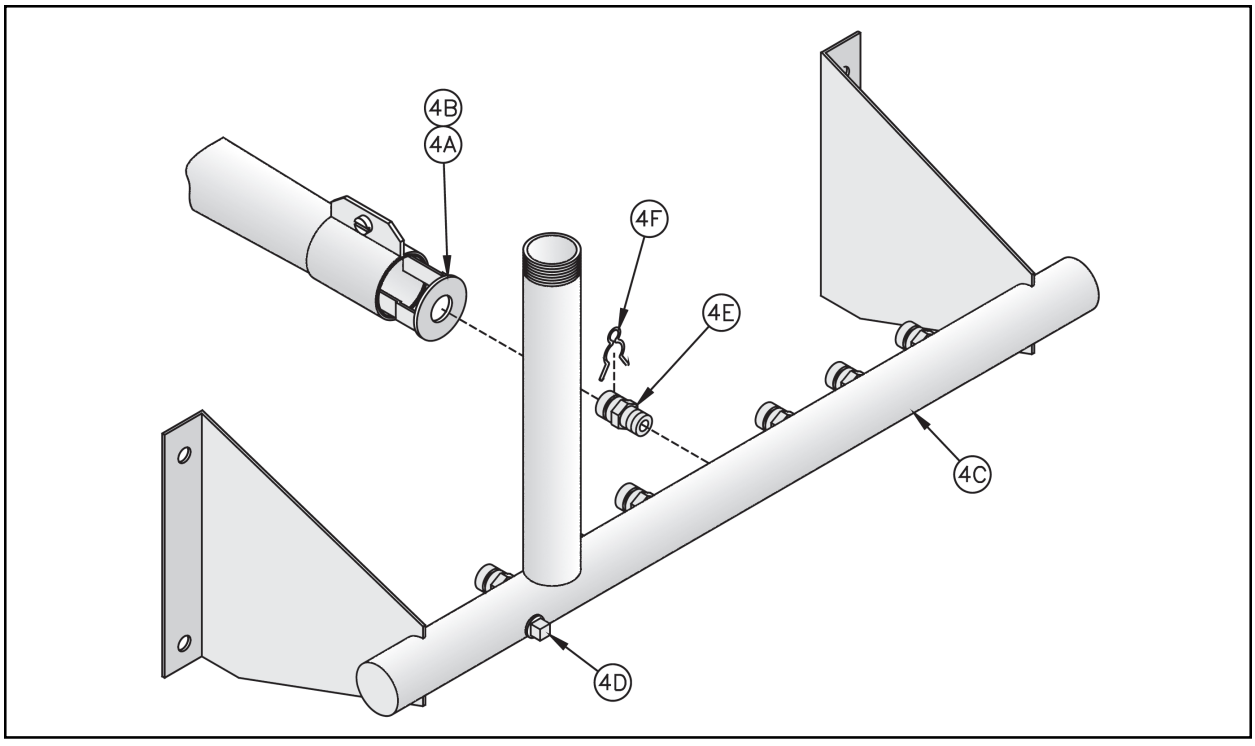
Item No.	Description	Part No.	Quantity					
			805B	806B	807B	808B	809B	810B
1. Heat Exchanger Assembly								
1	Complete	6171605	1	---	---	---	---	---
		6171606	---	1	---	---	---	---
		6171607	---	---	1	---	---	---
		6171608	---	---	---	1	---	---
		6171609	---	---	---	---	1	---
		6171610	---	---	---	---	---	1
1A	Left End Section	7171601	1	1	1	1	1	1
1B	Intermediate Section	7171603	3	4	5	6	7	8
1C	Right End Section	7171602	1	1	1	1	1	1
1D	Tie Rod	80861032	1	---	---	---	---	---
	Tie Rod	80861033	---	1	---	---	---	---
	Tie Rod	80861013	---	---	1	---	---	---
	Tie Rod	80861034	---	---	---	1	---	---
	Tie Rod	80861035	---	---	---	---	1	---
	Tie Rod	80861036	---	---	---	---	---	1
1E	Washer	80860600	4	4	4	4	4	4
1F	Nut	80860400	4	4	4	4	4	4
1G	Slip Nipple, 3"	7066002	8	10	12	14	16	18



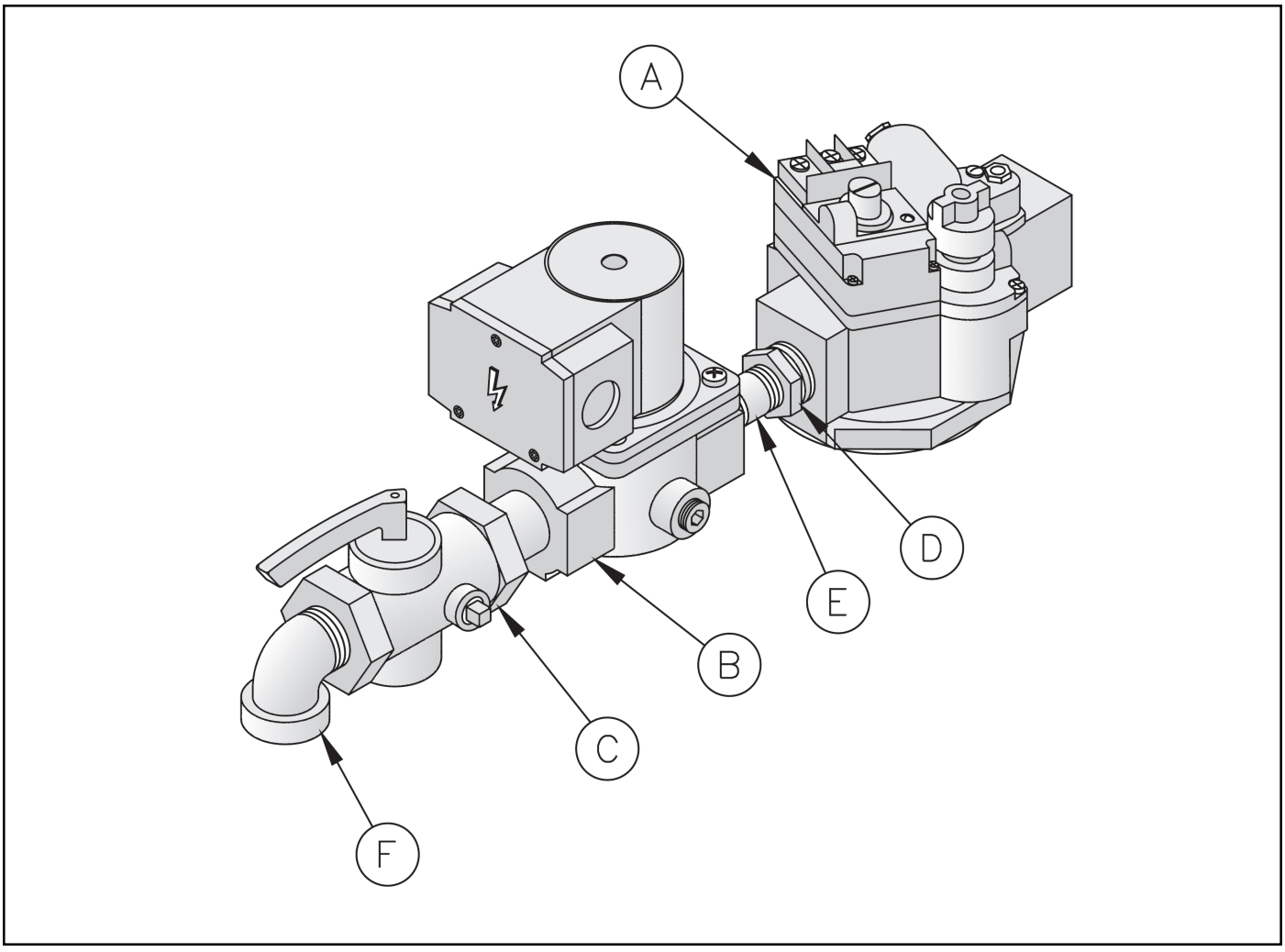
Item No.	Description	Part No.	Quantity					
			805B	806B	807B	808B	809B	810B
2. Canopy								
2A	Canopy	6111605	1	----	----	----	----	----
		6111606	----	1	----	----	----	----
		6111607	----	----	1	----	----	----
		6111608	----	----	----	1	----	----
		6111609	----	----	----	----	1	----
		6111610	----	----	----	----	----	1
2B	Bolt, Carriage, ¼-20 x 1"	80860115	2	2	2	2	2	2
2C	Washer, ¼" Flat	80860603	2	2	2	2	2	2
2D	Nut, ¼" - 20	80860407	2	2	2	2	2	2

Item No.	Description	Part No.	Quantity					
			805B	806B	807B	808B	809B	810B
3. Base Assembly								
3A	Base End Panel	7181601	2	2	2	2	2	2
3B	Base Channel Assembly	61816052	2	---	---	---	---	---
		61816062	---	2	---	---	---	---
		61816072	---	---	2	---	---	---
		61816082	---	---	---	2	---	---
		61816092	---	---	---	---	2	---
		61816102	---	---	---	---	---	2
3C	Base Rear Panel Assembly	61816051	1	---	---	---	---	---
		61816061	---	1	---	---	---	---
		61816071	---	---	1	---	---	---
		61816081	---	---	---	1	---	---
		61816091	---	---	---	---	1	---
		61816101	---	---	---	---	---	1
3D	Base Front Panel Assembly	61816053	1	---	---	---	---	---
		61816063	---	1	---	---	---	---
		61816073	---	---	1	---	---	---
		61816083	---	---	---	1	---	---
		61816093	---	---	---	---	1	---
		61816103	---	---	---	---	---	1
3E	Burner Access Panel Assembly	61816054	1	---	---	---	---	---
		61816064	---	1	---	---	---	---
		61816074	---	---	1	---	---	---
		61816084	---	---	---	2	---	---
		61816094	---	---	---	---	2	---
		61816104	---	---	---	---	---	2
3F	Jacket Attachment Bracket	7041601	4	4	4	4	4	4
3G	Bolt, Carriage, ¼-20 x 1¼"	80860106	4	4	4	4	4	4
3H	Washer, ¼" Flat	80860603	4	4	4	4	4	4
3J	Nut, ¼-20	80860407	4	4	4	4	4	4
3K	Screw, Self Tapping, ¼-20 x ½"	80860700	3	4	4	5	5	6
3L	Screw, Cap, Hex Head, 5/16" - 18 x ¾"	80861302	2	2	2	2	2	2
3M	Screw, Cap, Hex Head, 5/16" - 18 x 1¼"	80861311	6	6	6	6	6	6
3N	Screw, Sheet Metal, #8 x ½"	80860000	8	8	8	8	8	8
3P	Washer, 3/8" Flat	80860600	6	6	6	6	6	6
3Q	Nut, 5/16" - 18	80860403	6	6	6	6	6	6
3R	Screw, Self Tapping, ¼ -20 x ¾"	80860702	10	10	10	10	10	10

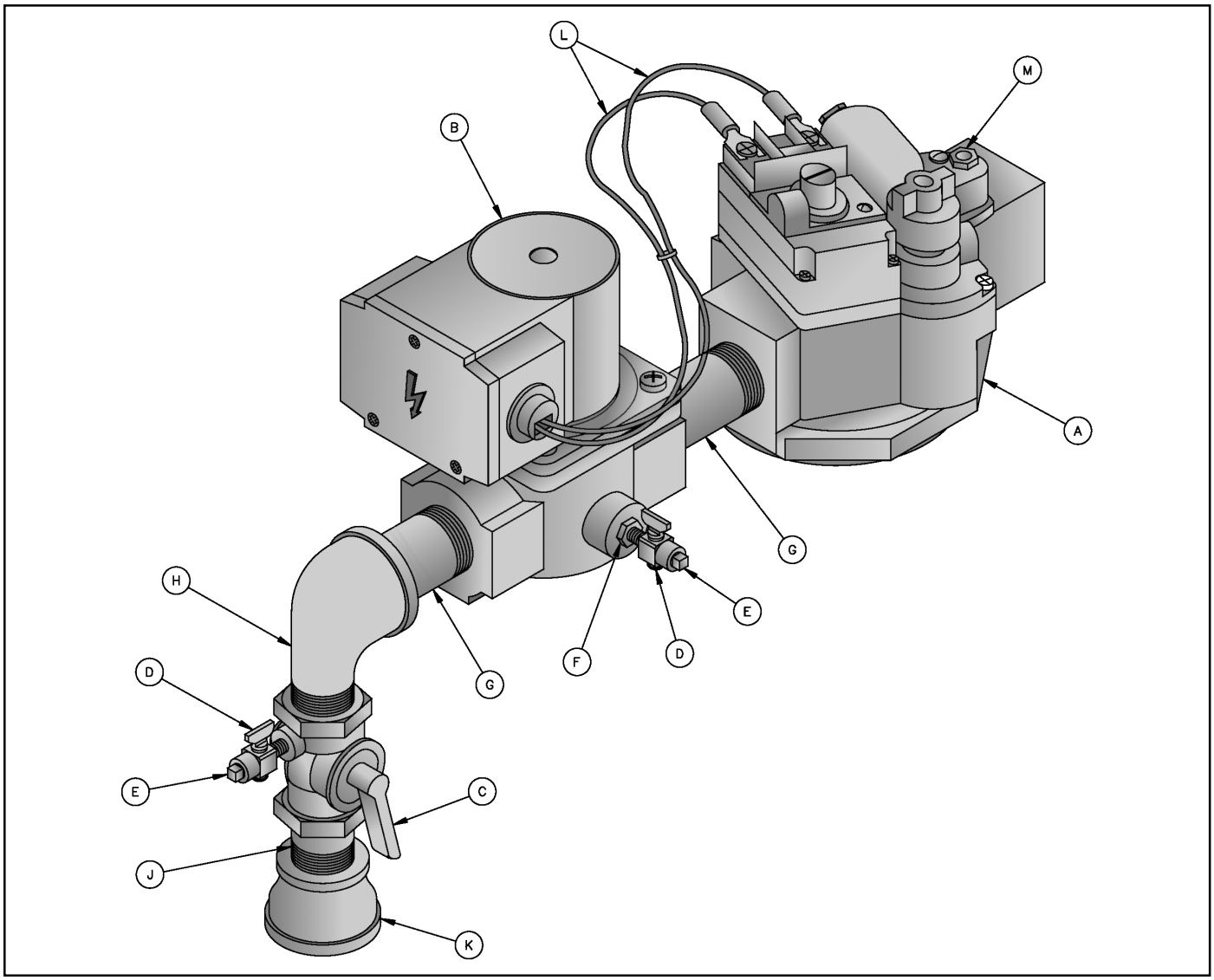
Item No.	Description	Part No.	Quantity					
			805B	806B	807B	808B	809B	810B
4. Manifold and Main Burners								
4A	Main Burner	8231602	8	10	12	15	17	19
4B	Main Burner with Pilot Bracket, Standing Pilot (24V)	8231601	---	1	1	1	1	1
	Main Burner with Pilot Bracket, Honeywell EI	8231604	1	1	1	1	1	1
	Main Burner with Pilot Bracket, Johnson EI							
	Main Burner with Pilot Bracket, OP	8231603	---	1	1	1	1	1
	Main Burner with Pilot Bracket, EP							
4C	Manifold	82216051	1	---	---	---	---	---
		82216061	---	1	---	---	---	---
		82216071	---	---	1	---	---	---
		82216081	---	---	---	1	---	---
		82216091	---	---	---	---	1	---
		82216101	---	---	---	---	---	1
4D	Pipe Plug, 1/8 NPT (Included with 4C)	---	1	1	1	1	1	1
4E	Main Burner Orifice, #37 (Natural Gas Only) *	822601	9	11	13	16	18	20
	Main Burner Orifice, #52 (LP/Propane Only) *	822641						
4F	Hitch Pin Clip	822604	9	11	13	16	18	20
* Main burner orifice sizes shown for normal altitude (0-2000 feet). For High Altitude consult factory.								



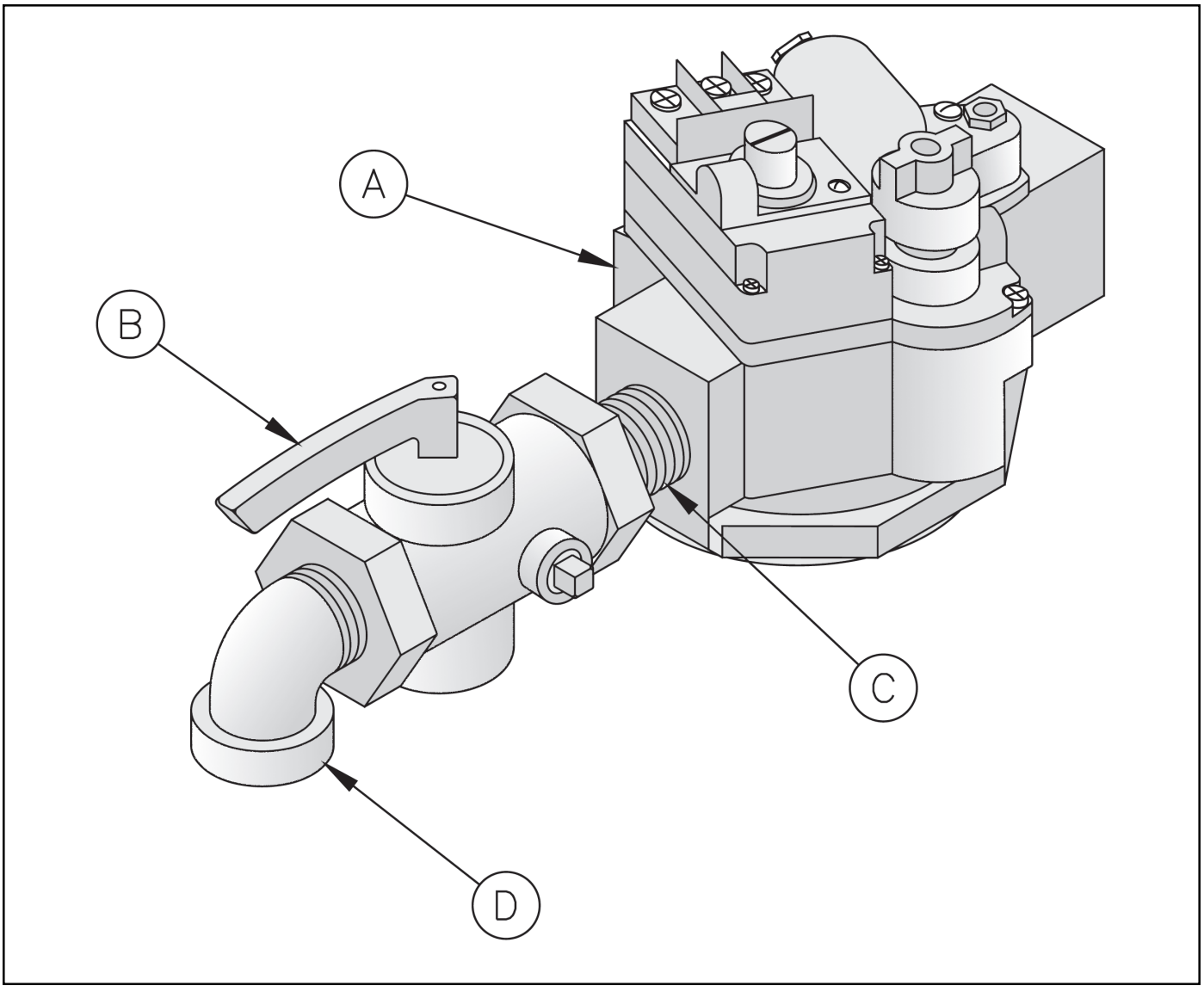
ITEM NO.	DESCRIPTION	PART NUMBER	SIZE	QUANTITY
5-1 Gas Train -- Standing Pilot (24V, OP) 24V: USA & Canada, 6 & 7 Section, Natural & LP Gas OP: USA & Canada, 6 - 10 Section, Natural & LP Gas				
A	Gas Valve, Robertshaw 7000ERHC-S7C, Natural Gas, 1"NPT	81660156	806B-810B	1
	Gas Valve, Robertshaw 7000ERHC-LP-S7C, LP Gas, 1"NPT	81660157		
B	Solenoid Gas Valve, Honeywell V8295A1024, ¾"NPT	81660235	806B-807B	1
	Solenoid Gas Valve, Honeywell V8295A1032, 1"NPT	81660236	808B-810B	
C	Lubricated Manual Shut-Off Valve, Newman-Milliken 200M, 1"NPT	822619	808B-810B Canada Only	1
D	Hex Bushing, 1"NPT x ¾"NPT	806600501	806B & 807B	1
E	Nipple, ¾"NPT x 2" Lg.	806600003	806B & 807B	1
	Nipple, 1"NPT x 2" Lg.	806600004	808B-810B	USA: 1
				Canada: 2
F	Street Elbow, 1"NPT x ¾"NPT	806601512	806B & 807B	1
	Street Elbow, 1¼"NPT x 1"NPT	806601513	808B-810B	



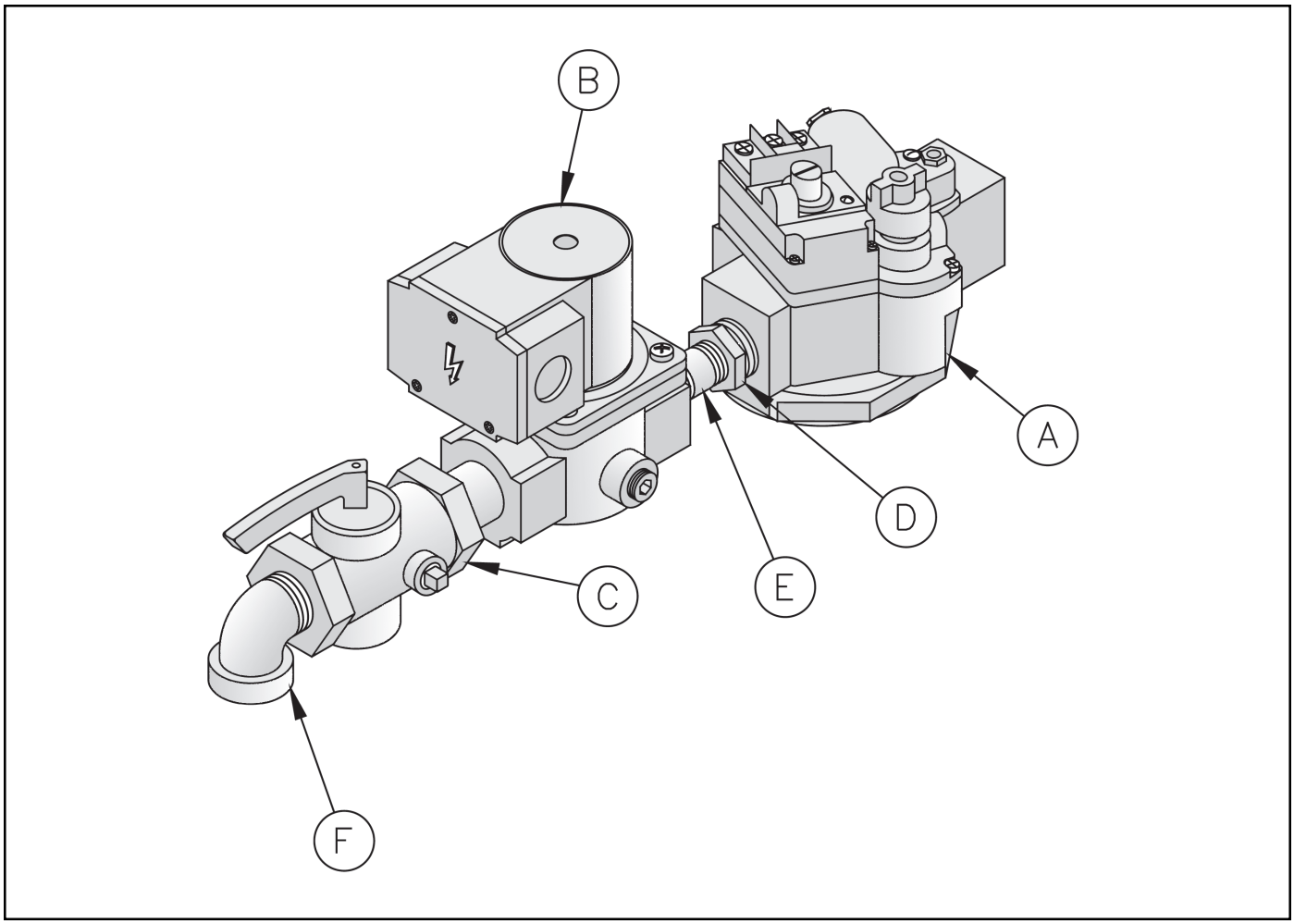
ITEM NO.	DESCRIPTION	PART NUMBER	QUANTITY
5-2 Gas Train -- Standing Pilot (OP-CSD-1) OP-CSD-1: USA Only, 10 Section, LP Gas Only			
A	Gas Valve, Robertshaw 7000GVERHC-S7C, LP Gas, 1"NPT	81660271	1
B	Solenoid Gas Valve, Honeywell V8295A1032, 1"NPT	81660236	1
C	Lubricated Manual Shut-Off Valve, ConBraCo #50-403-02, 1" NPT	822615	1
D	Leak Test/Shut-off Valve, ConBraCo #56-221-01, 1/8" x 1/8"	822679	2
E	Pipe Plug, 1/8"	806603594	2
F	Hex Bushing, 1/4" x 1/8"	806600520	1
G	Nipple, 1" x 2" Long	806600004	2
H	Street Elbow, 90° x 1"	806601514	1
J	Close Nipple, 1"	806600033	1
K	Malleable Coupling, 1-1/4" x 1"	806602502	1
L	Wiring Harness, Gas Valve to Solenoid Valve	6136230	1
M	Pilot Outlet Plug, Honeywell #394424	8226051	1



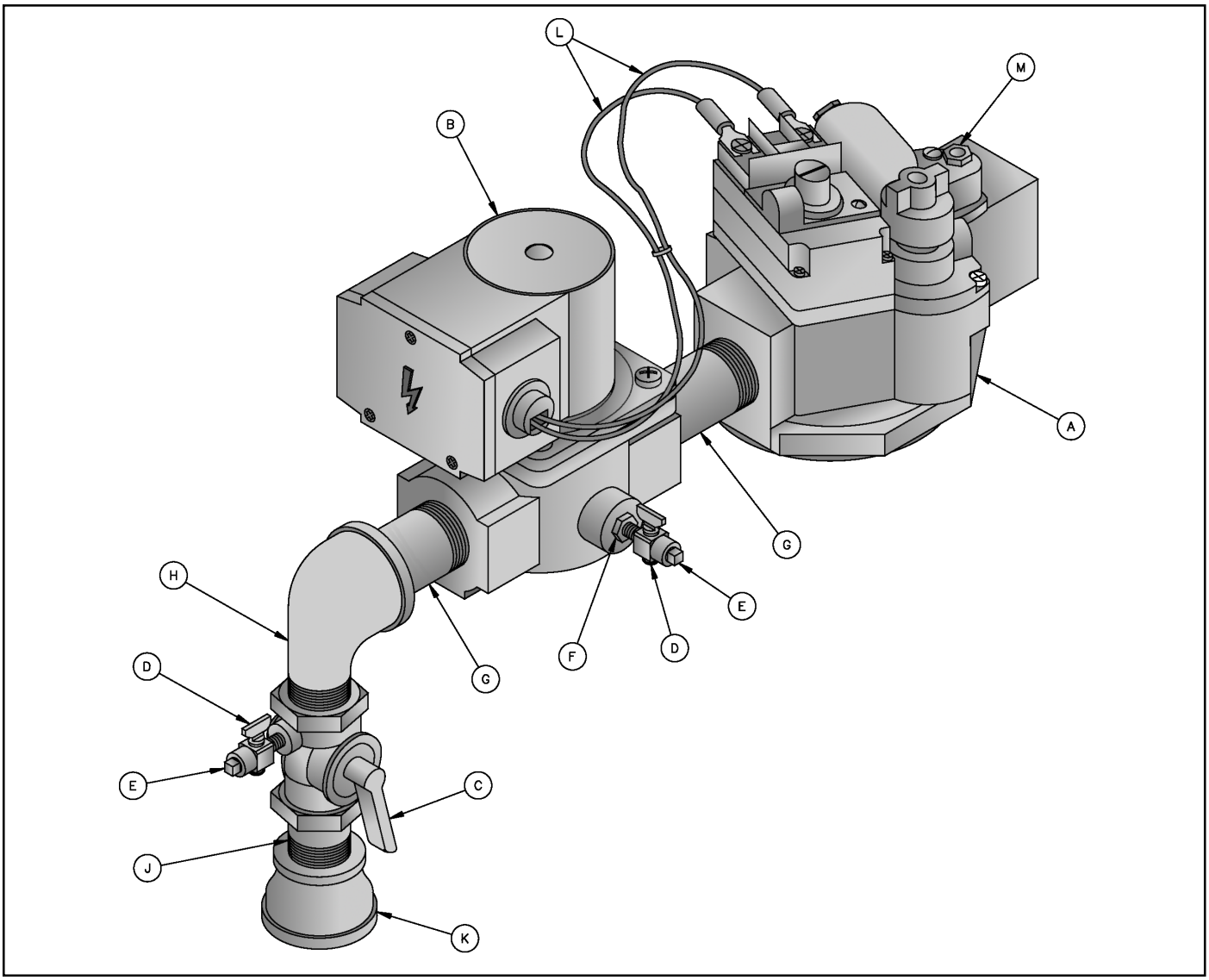
ITEM NO.	DESCRIPTION	PART NUMBER	SIZE	QUANTITY
5-3 Gas Train - Intermittent Ignition (EI) USA: 5 - 10 Section, Natural and LP Gas Canada: 5 - 10 Section, Natural Gas 5 - 7 Section, LP Gas				
A	Gas Valve, Robertshaw 7000DERHC, Natural Gas, 1"NPT	81660151	805B-810B	1
	Gas Valve, Robertshaw 7000DERHC-LP, LP Gas, 1"NPT	81660158	USA: 805B-810B Canada: 805B-807B	
B	Lubricated Manual Shut-Off Valve, Newman-Milliken 200M, 1"NPT	822619	808B-810B Canada Only	1
C	Nipple, 1"NPT x 2" Lg.	806600004		
D	Street Elbow, 1"NPT	806601514	805B-807B	1
	Street Elbow, 1¼"NPT x 1"NPT	806601513	808B-810B	



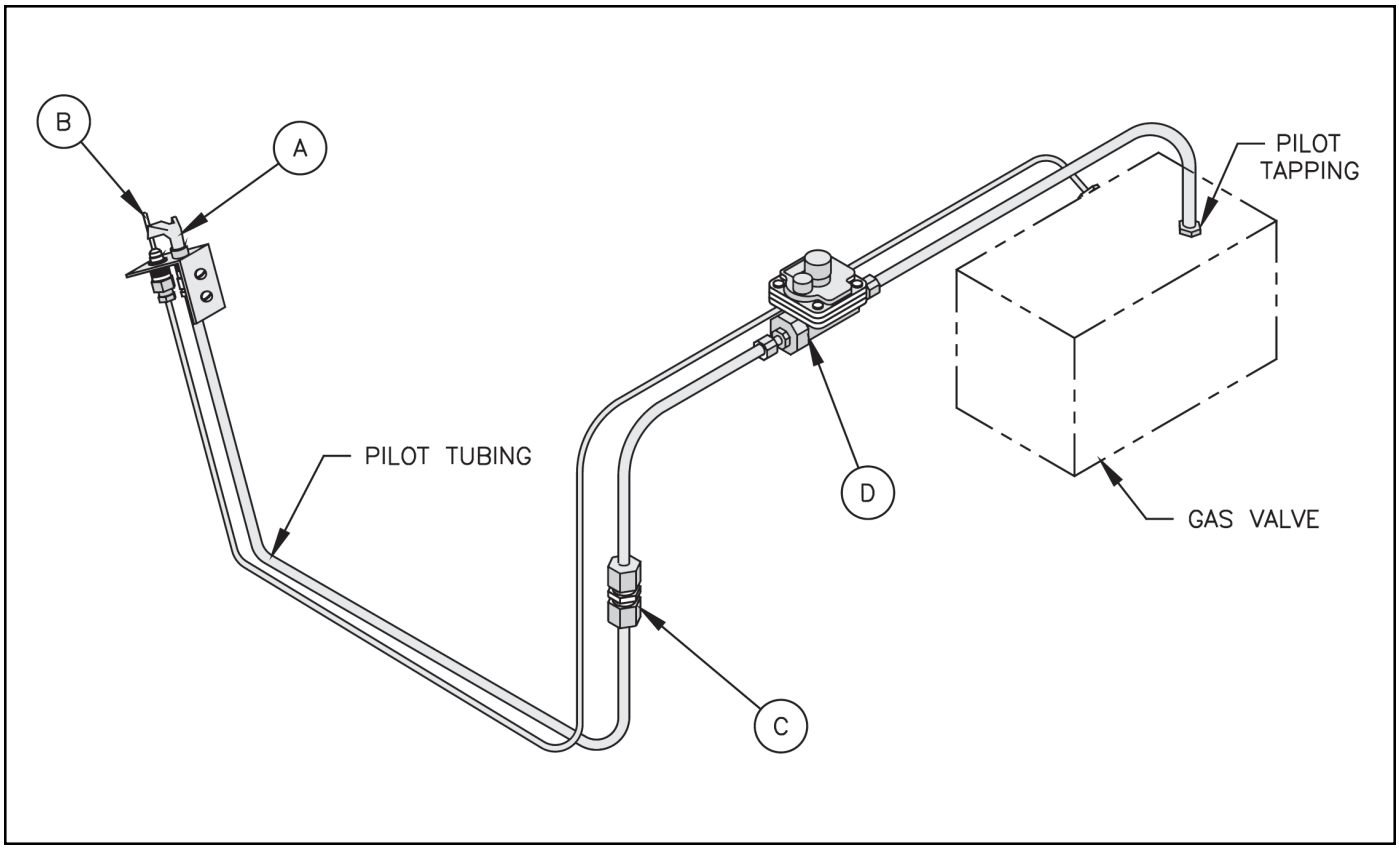
ITEM NO.	DESCRIPTION	PART NUMBER	SIZE	QUANTITY
5-4 Gas Train - Intermittent Ignition (EP) USA & Canada: 6 - 10 Section, Natural Gas Only				
A	Gas Valve, Robertshaw 7000GVERHC-S7C, Natural Gas, 1"NPT	81660168	806B-810B	1
B	Solenoid Gas Valve, Honeywell V8295A1024, ¾"NPT	81660235	806B-807B	1
	Solenoid Gas Valve, Honeywell V8295A1032, 1"NPT	81660236	808B-810B	
C	Lubricated Manual Shut-Off Valve, Newman-Milliken 200M, 1"NPT	822619	808B-810B Canada Only	1
D	Hex Bushing, 1"NPT x ¾"NPT	806600501	806B & 807B	1
E	Nipple, ¾"NPT x 2" Lg.	806600003	806B & 807B	1
	Nipple, 1"NPT x 2" Lg.	806600004	808B-810B	USA: 1
				Canada: 2
F	Street Elbow, 1"NPT x ¾"NPT	806601512	806B & 807B	1
	Street Elbow, 1¼"NPT x 1"NPT	806601513	808B-810B	



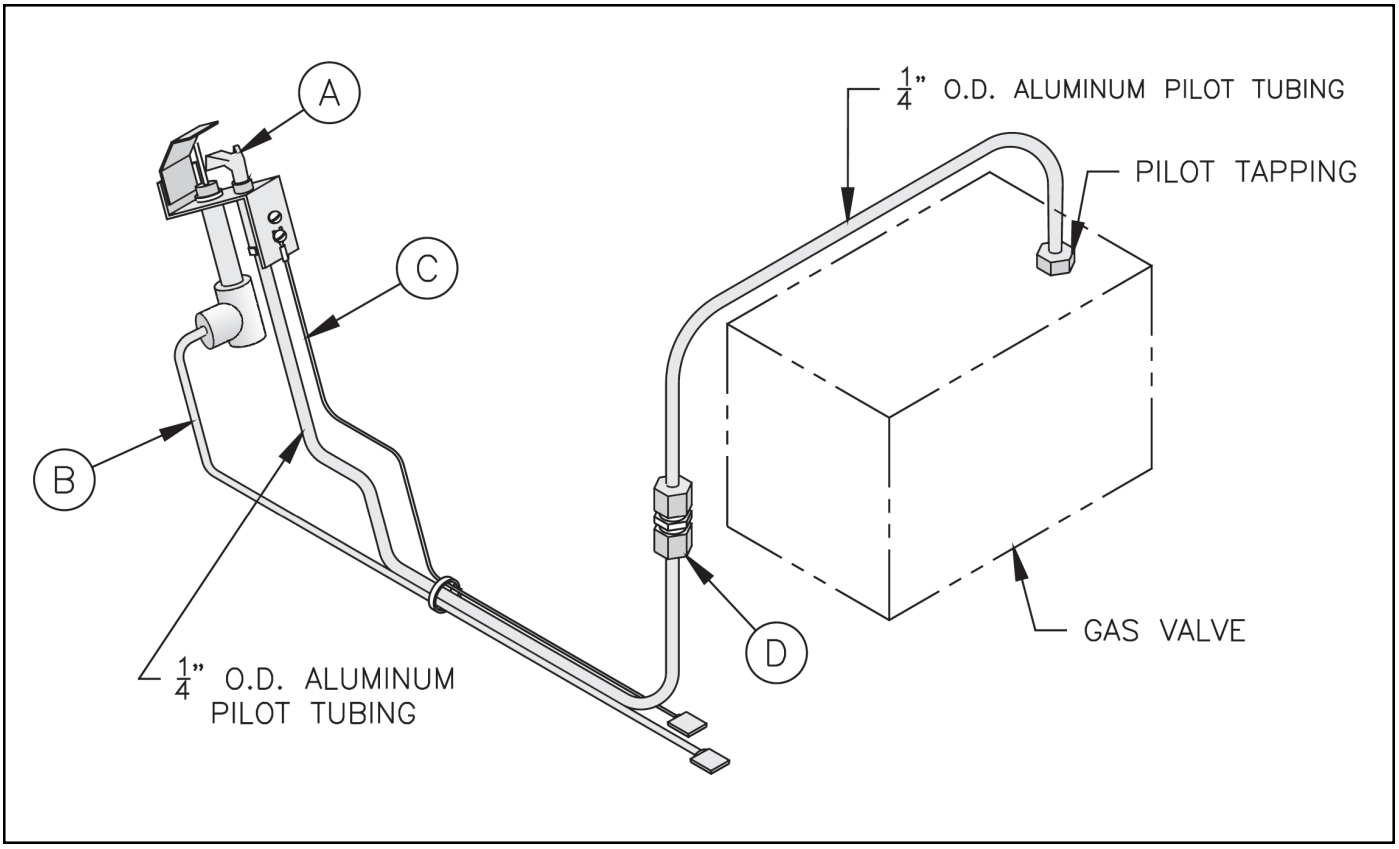
ITEM NO.	DESCRIPTION	PART NUMBER	QUANTITY
5-5 Gas Train - Intermittent Ignition (EP-CSD-1) USA Only, 8 - 10 Section, Natural Gas Only			
A	Gas Valve, Robertshaw 7000GVERHC-S7C, Nat. Gas, 1"NPT	81660168	1
B	Solenoid Gas Valve, Honeywell V8295A1032, 1"NPT	81660236	1
C	Lubricated Manual Shut-Off Valve, ConBraCo #50-403-02, 1" NPT	822615	1
D	Leak Test/Shut-off Valve, ConBraCo #56-221-01, 1/8" x 1/8"	822679	2
E	Pipe Plug, 1/8"	806603594	2
F	Hex Bushing, 1/4" x 1/8"	806600520	1
G	Nipple, 1" x 2" Long	806600004	2
H	Street Elbow, 90° x 1"	806601514	1
J	Close Nipple, 1"	806600033	1
K	Malleable Coupling, 1-1/4" x 1"	806602502	1
L	Wiring Harness, Gas Valve to Solenoid Valve	6136230	1
M	Pilot Outlet Plug, Honeywell #394424	8226051	1



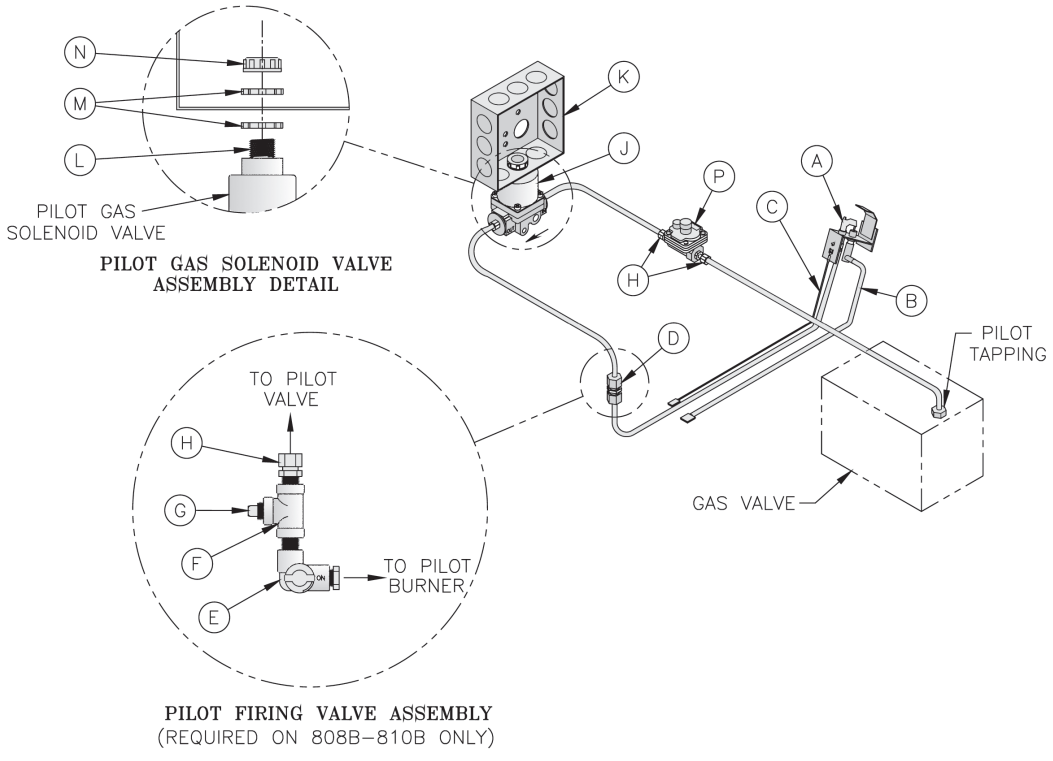
ITEM NO.	DESCRIPTION	PART NUMBER	SIZE	QUANTITY
5-6 Pilot Assembly and Piping -- Standing Pilot (24V) USA & Canada: 6 & 7 Section, Natural and LP Gas				
A	Pilot Burner, Honeywell Q314A3687, Natural Gas	8236033	All	1
	Pilot Burner, Honeywell Q314A3828, LP Gas	8236034		
B	Thermocouple, Honeywell Q309A1996 w/36"Lg. Lead	8236004		
C	Brass Compression Union, ¼" OD Tube	8236008	806B & 807B	1
D	Regulator, Maxitrol RV12LT, Natural Gas	8226005	Canada: 806B & 807B Natural Gas Only	1
E	Brass Compression Adapter, ¼" OD Tube x 1/8"NPT	822630	Canada: 806B & 807B Natural Gas Only	2



ITEM NO.	DESCRIPTION	PART NUMBER	SIZE	QUANTITY
5-7 Pilot Assembly and Piping - Intermittent Ignition (Honeywell EI) USA 5 - 10 Section, Natural and LP Gas				
A	Pilot Burner, Honeywell Q348A1002, Natural Gas	8236072U	805B-810B	1
	Pilot Burner, Honeywell Q348A1010, LP Gas	8236081		
B	Igniter/Sensor Cable, 36" Lg., Honeywell 394803-2	8236121		1
C	Ground Wire Assembly	6136054		1
D	Brass Compression Union, ¼" OD Tube	8236008		1



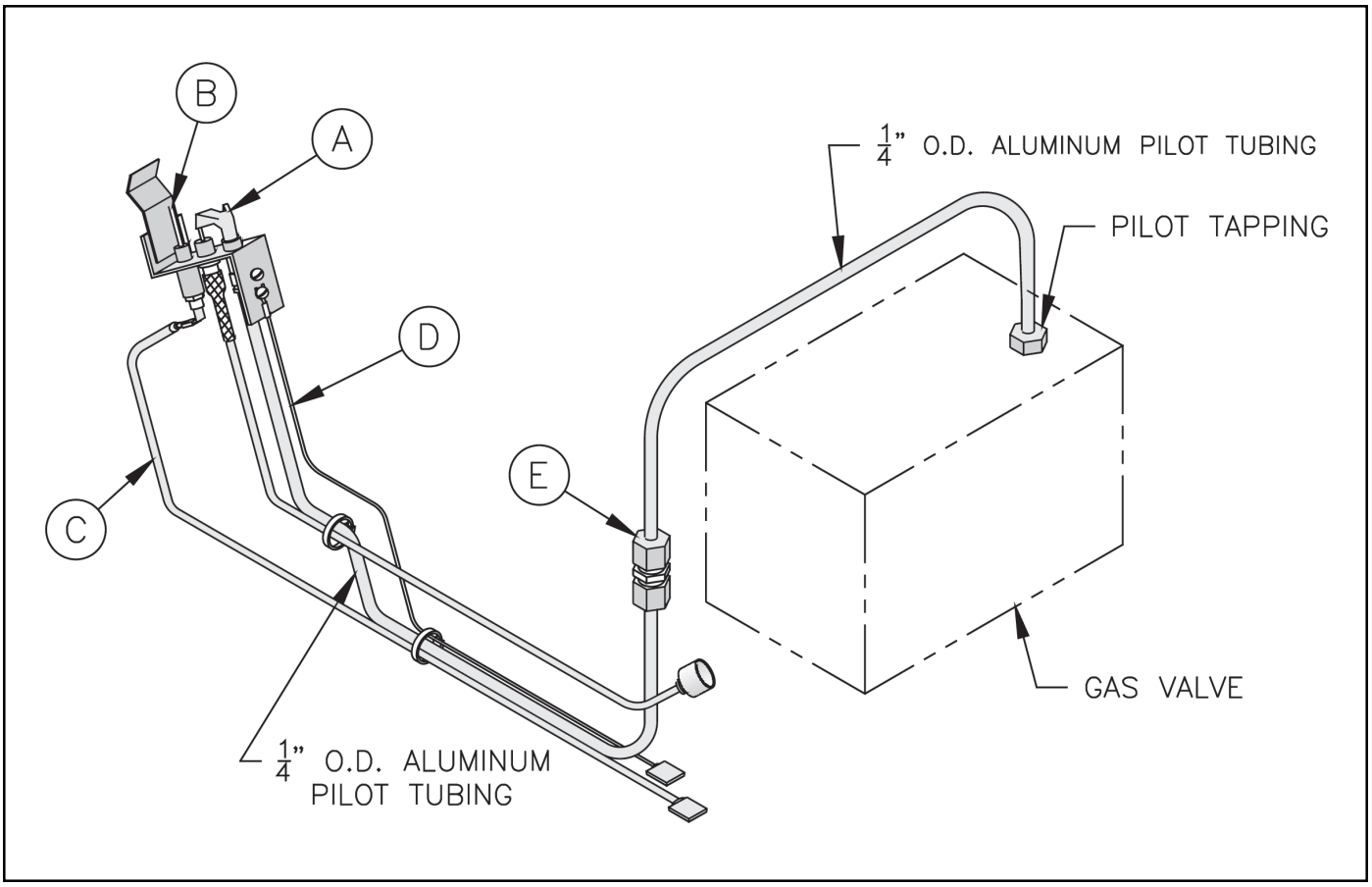
ITEM NO.	DESCRIPTION	PART NUMBER	SIZE	QUANTITY
5-8 Pilot Assembly and Piping -- Intermittent Ignition (Honeywell EI) Canada 5- 10 Section, Natural Gas 5 - 7 Section, LP Gas				
A	Pilot Burner, Honeywell Q348A1002, Natural Gas	8236072U	805B-810B	1
	Pilot Burner, Honeywell Q348A1010, LP Gas	8236081	805B-807B	
B	Igniter/Sensor Cable, 36" Lg., Honeywell 394800-36	8236084	All	1
C	Ground Wire Assembly	6136054		
D	Brass Compression Union, ¼" OD Tube	8236008	805B-807B	1
E	Shut-off Valve, Essex P2L	822645	808B-810B	1
F	Pipe Tee, 1/8"NPT, Malleable	806601005		
G	Pipe Plug, 1/8"NPT, Sq. Head	806603508		
H	Brass Compression Adapter, ¼" OD Tube x 1/8"NPT	822630	805B-807B Natural Gas	2
			808B-810B Natural Gas	3
			805B-807B LP Gas	1
J	Solenoid Gas Valve, Johnson H91WG-6	822666	All	1
K	Junction Box, 4" Sq. x 1½" Deep	8136259		
L	Rigid Conduit Nipple, ½"NPT x 1½" Lg.	8136019		
M	Conduit Locknut, ½"	8136220		2
N	Plastic Insulating Bushing, ½"	8136034		1
P	Regulator, Maxitrol RV12LT, Natural Gas	8226005	805B-810B Natural Gas Only	1



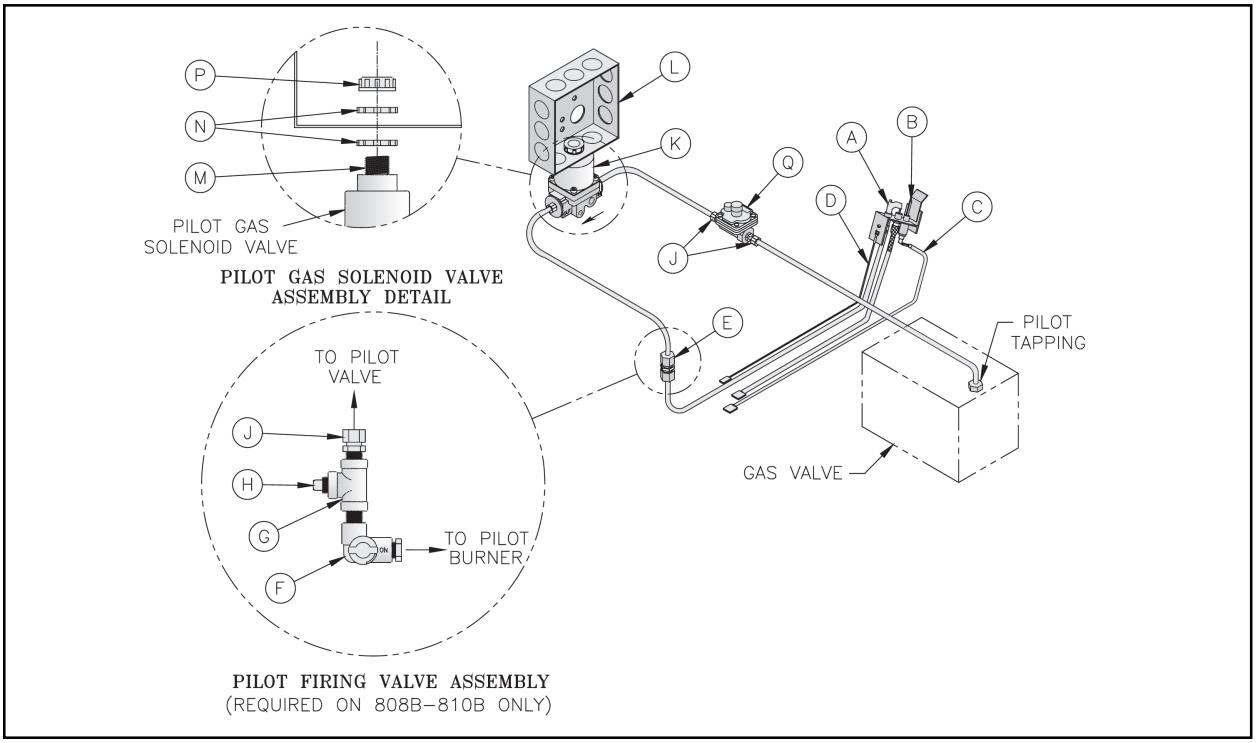
PILOT GAS SOLENOID VALVE ASSEMBLY DETAIL

PILOT FIRING VALVE ASSEMBLY (REQUIRED ON 808B–810B ONLY)

ITEM NO.	DESCRIPTION	PART NUMBER	SIZE	QUANTITY
5-9 Pilot Assembly and Piping -- Intermittent Ignition (Johnson EI) USA 5 - 10 Section, Natural and LP Gas				
A	Pilot Burner, Johnson J991LYW7225, Natural Gas (Includes Ignition Lead)	8236050	805B-810B	1
	Pilot Burner, Johnson J991LYW9840D, LP Gas (Includes Ignition Lead)	8236086		
B	Sensing Probe, Johnson Y75AA-C	8236040		1
C	Sensor Lead, Johnson Y57AH-36	8236051		1
D	Ground Wire Assembly	6136054		1
E	Brass Compression Union, ¼" OD Tube	8236008		1



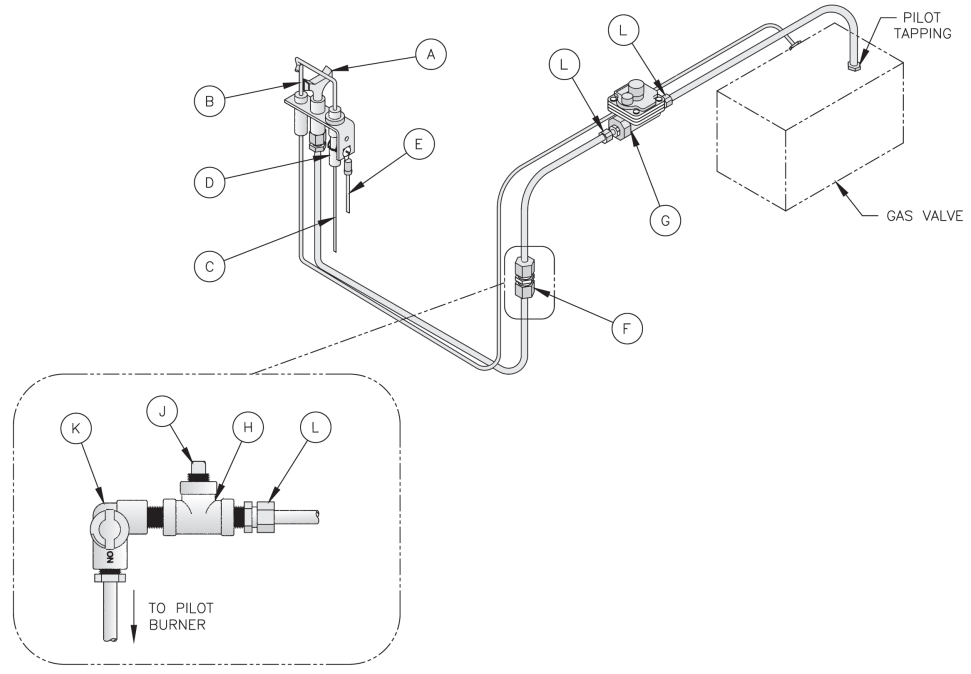
ITEM NO.	DESCRIPTION	PART NUMBER	SIZE	QUANTITY
5-10 Pilot Assembly and Piping -- Intermittent Ignition (Johnson EI) Canada 5 - 10 Section, Natural Gas 5 - 7 Section, LP Gas				
A	Pilot Burner, Johnson J991LYW7225, Natural Gas (Includes Ignition Lead)	8236050	805B-810B	1
	Pilot Burner, Johnson J991LYW9840D, LP Gas (Includes Ignition Lead)	8236086	805B-807B	
B	Sensing Probe, Johnson Y75AA-C	8236040	All	1
C	Sensor Lead, Johnson Y57AH-36	8236051		1
D	Ground Wire Assembly	6136054		1
E	Brass Compression Union, ¼" OD Tube	8236008	805B-807B	1
F	Shut-off Valve, Essex P2L	822645	808B-810B	1
G	Pipe Tee, 1/8"NPT, Malleable	806601005		1
H	Pipe Plug, 1/8"NPT, Sq. Head	806603508		1
J	Brass Compression Adapter, ¼" OD Tube x 1/8"NPT	822630	805B-807B Natural Gas	2
			808B-810B Natural Gas	3
			805B-807B LP Gas	1
K	Solenoid Gas Valve, Johnson H91WG-6	822666	All	1
L	Junction Box, 4" Sq. x 1½" Deep	8136259		1
M	Rigid Conduit Nipple, ½"NPT x 1½" Lg.	8136019		1
N	Conduit Locknut, ½"	8136220		2
P	Plastic Insulating Bushing, ½"	8136034		1
Q	Regulator, Maxitrol RV12LT, Natural Gas	8226005	805B-810B Natural Gas Only	1



PILOT GAS SOLENOID VALVE ASSEMBLY DETAIL

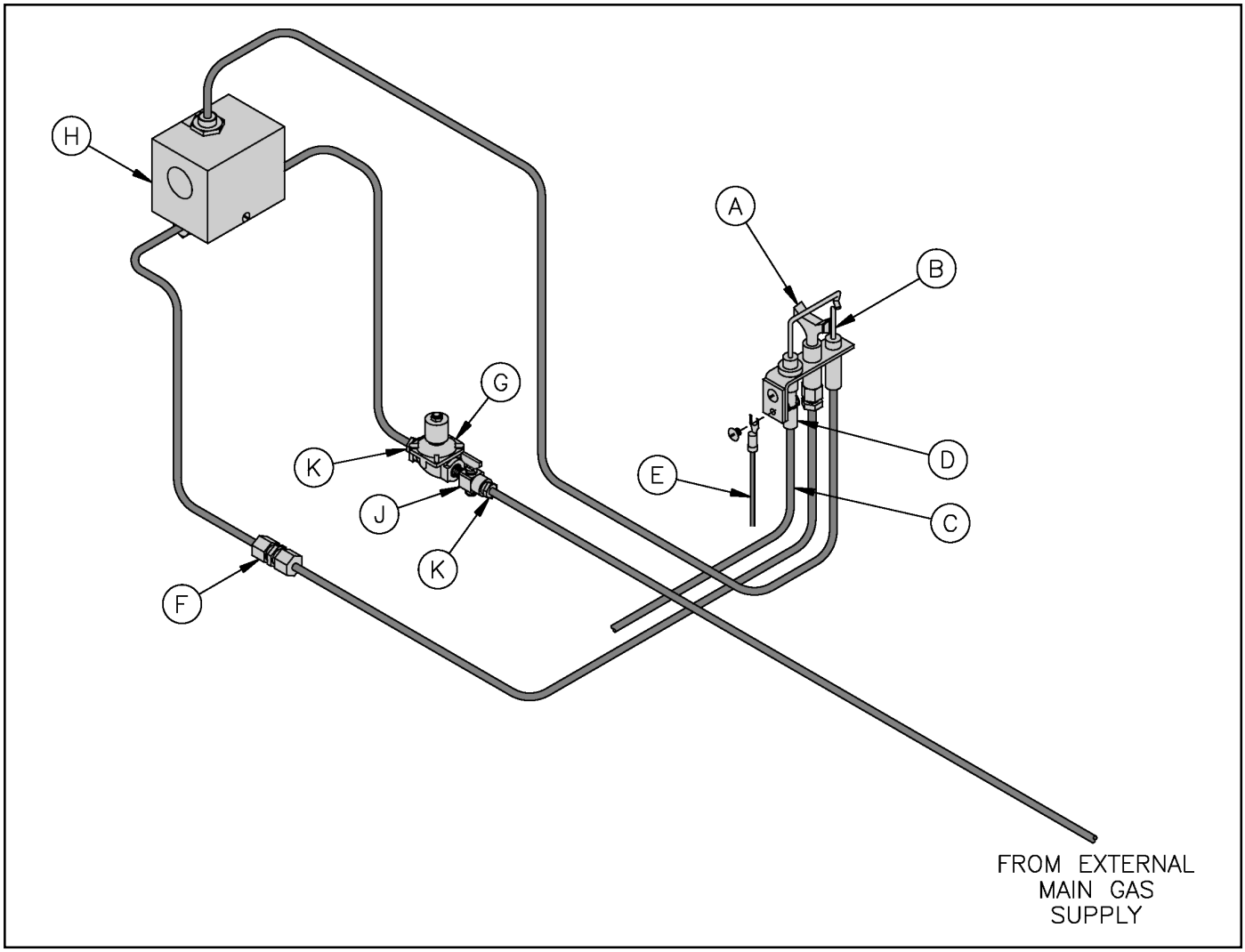
PILOT FIRING VALVE ASSEMBLY
(REQUIRED ON 808B–810B ONLY)

ITEM NO.	DESCRIPTION	PART NUMBER	SIZE	QUANTITY
5-11 Pilot Assembly and Piping -- Standing Pilot (OP) USA & Canada: 6 - 10 Section, Natural and LP Gas				
A	Pilot Burner, Honeywell Q179D1008, Natural Gas	8236025	806B-810B	1
	Pilot Burner, Honeywell Q179D1008 w/388146KD Orifice, LP Gas	6236039		
B	Thermocouple, Honeywell Q309A1996 w/36" Lg. Lead	8236004		1
C	Flame Rod Lead, Honeywell R1298020, 4 ft. Lg.	71362561		1
D	Rajah Connector, Honeywell 37356	8236021		1
E	Ground Wire Assembly	6136259		1
F	Brass Compression Union, ¼" OD Tube	8236008	USA: 806B-810B Canada: 806B & 807B	1
G	Regulator, Maxitrol RV12LT, Natural Gas	8226005	Canada: 806B-810B Natural Gas Only	1
H	Pipe Tee, 1/8"NPT, Malleable	806601005	808B-810B Canada Only	1
J	Pipe Plug, 1/8"NPT, Sq. Head	806603508		1
K	Shut-off Valve, Essex P2L	822645		1
L	Brass Compression Adapter, ¼" OD Tube x 1/8"NPT	822630	806B & 807B Natural Gas	2
			808B-810B Natural Gas	3
			806B-810B LP Gas	1

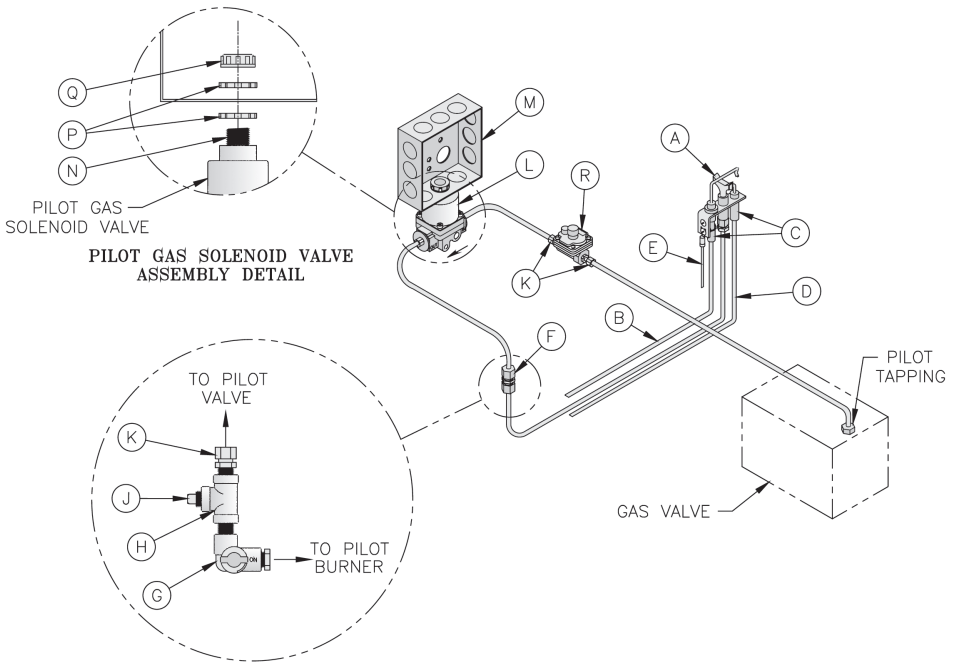


PILOT FIRING VALVE ASSEMBLY
(REQUIRED ON 808B–810B CANADA ONLY)

ITEM NO.	DESCRIPTION	PART NUMBER	SIZE	QUANTITY
5-12 Pilot Assembly and Piping -- Standing Pilot (OP-CSD-1) USA Only: 8- 10 Section, LP Gas Only				
A	Pilot Burner, Honeywell Q179D1008 w/388146KD Orifice, LP Gas	6236039	808B-810B	1
B	Thermocouple, Honeywell Q309A1996 w/36" Lg. Lead	8236004		1
C	Flame Rod Lead, Honeywell R1298020, 4 ft. Lg.	71362561		1
D	Rajah Connector, Honeywell 37356	8236021		1
E	Ground Wire Assembly	6136259		1
F	Brass Compression Union, ¼" OD Tube	8236008		1
G	Regulator, Maxitrol RV12LT, Nat./LP Gas	8226005		1
H	Pilot Switch, Johnson L62-GB-3C	80160138		1
J	ConBraCo Leak Test / Shut-Off Valve, 1/8" x 1/8"	822679		1
K	Brass Compression Adapter, ¼" OD Tube x 1/8"NPT	822630		2



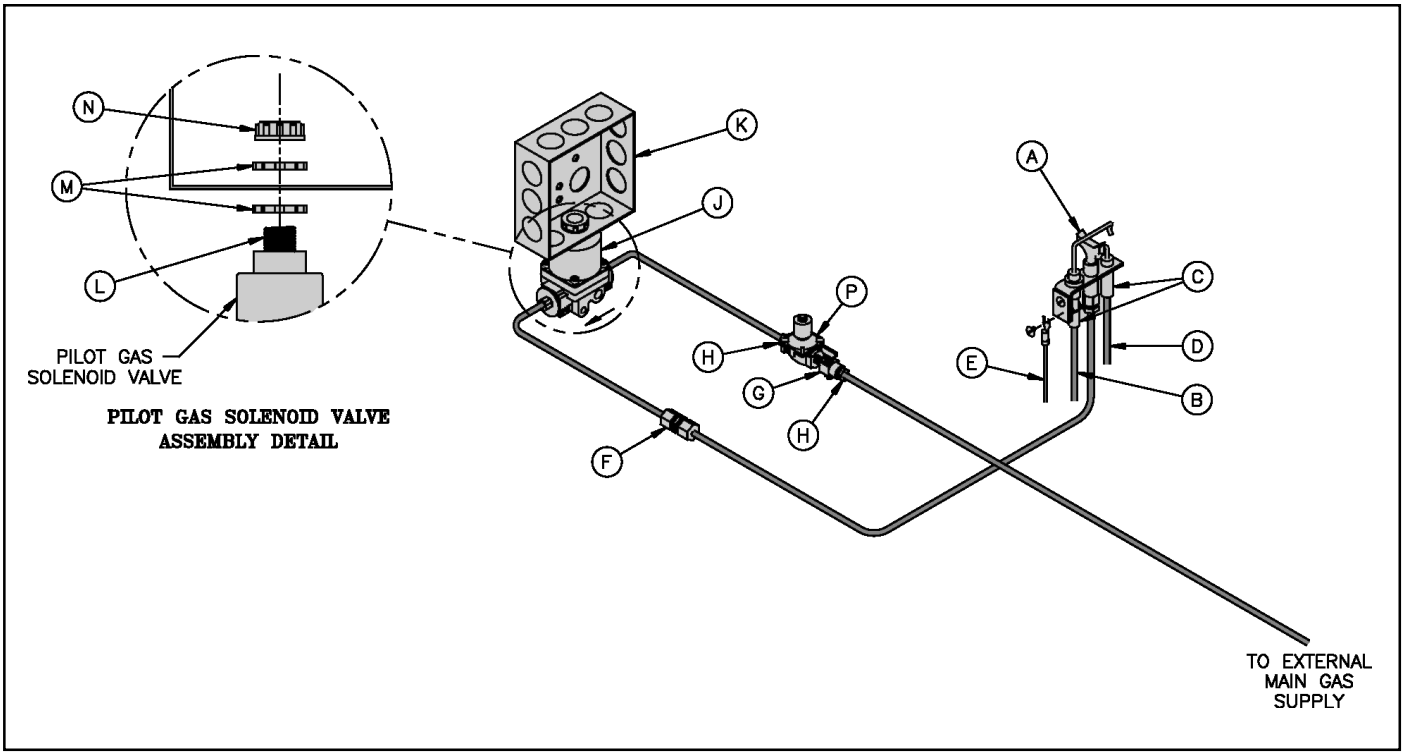
ITEM NO.	DESCRIPTION	PART NUMBER	SIZE	QUANTITY
5-13 Pilot Assembly and Piping -- Intermittent Ignition (EP) USA & Canada: 6 - 10 Section, Natural Gas Only				
A	Pilot Burner, Honeywell Q179C1009, Natural Gas	8236017	806B-810B	1
B	Flame Rod Lead, Honeywell R1298020, 4 ft. Lg.	71362561		1
C	Rajah Connector, Honeywell 37356	8236021		2
D	Ignition Lead, Honeywell R1061012, 3 ft. Lg.	7136247		1
E	Ground Wire Assembly	6136259		1
F	Brass Compression Coupling, ¼" OD Tube	8236008	806B & 807B USA & Canada 808B-810B USA Only	1
G	Shut-off Valve, Essex P2L	822645	808B-810B Canada Only	1
H	Pipe Tee, 1/8"NPT, Malleable	806601005		1
J	Pipe Plug, 1/8"NPT, Sq. Head	806603508		1
K	Brass Compression Adapter, ¼" OD Tube x 1/8"NPT	822630	806B & 807B Canada Only	2
			808B-810B Canada Only	3
L	Solenoid Gas Valve, Johnson H91WA-4	822662	806B-810B	1
M	Junction Box, 4" Sq. x 1½" Deep	8136259		1
N	Rigid Conduit Nipple, ½"NPT x 1½" Lg.	8136019		1
P	Conduit Locknut, ½"	8136220		2
Q	Plastic Insulating Bushing, ½"	8136034		1
R	Regulator, Maxitrol RV12LT, Natural Gas	8226005	806B-810B Canada Only	1

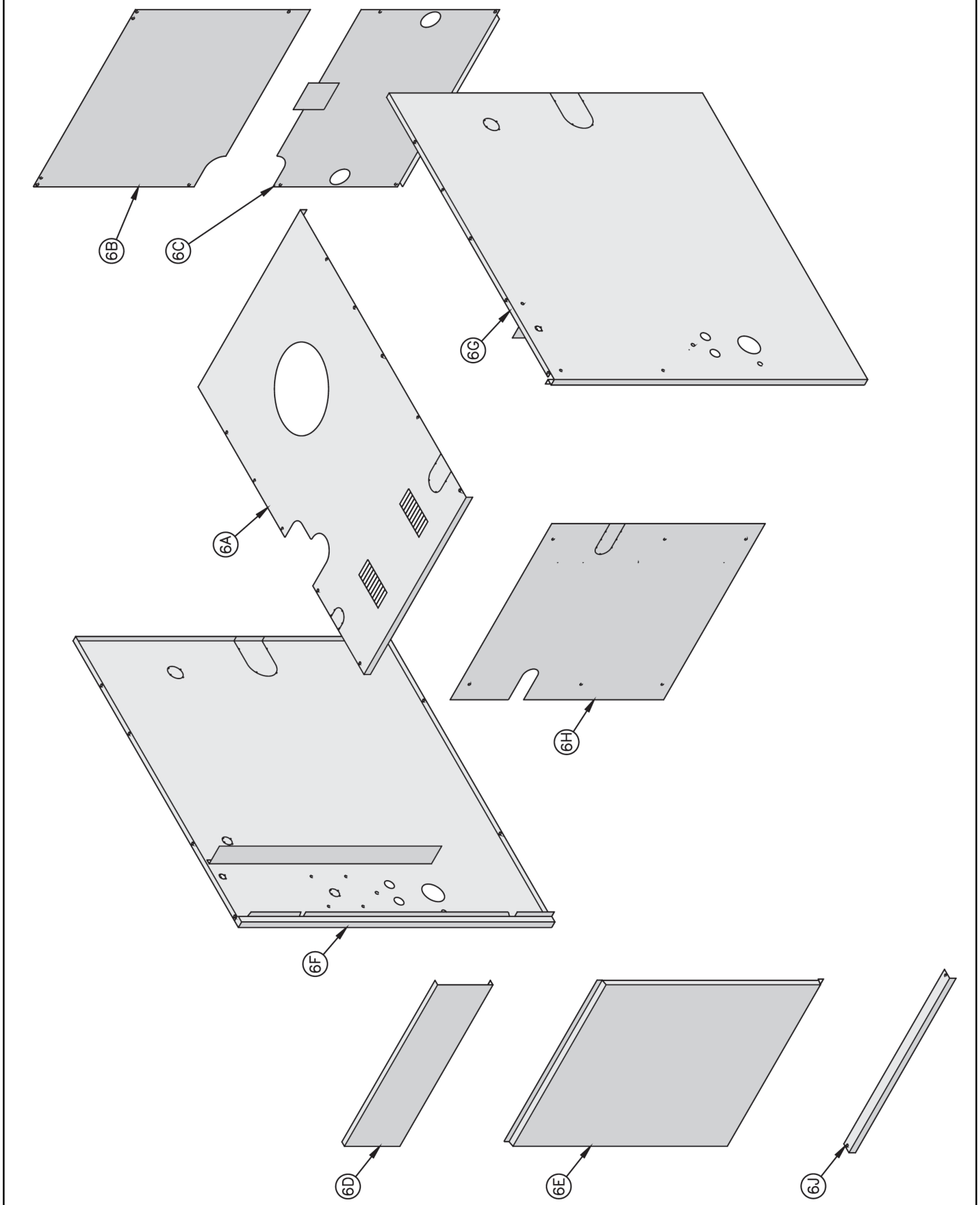


PILOT GAS SOLENOID VALVE ASSEMBLY DETAIL

PILOT FIRING VALVE ASSEMBLY
(REQUIRED ON 808B–810B CANADA ONLY)

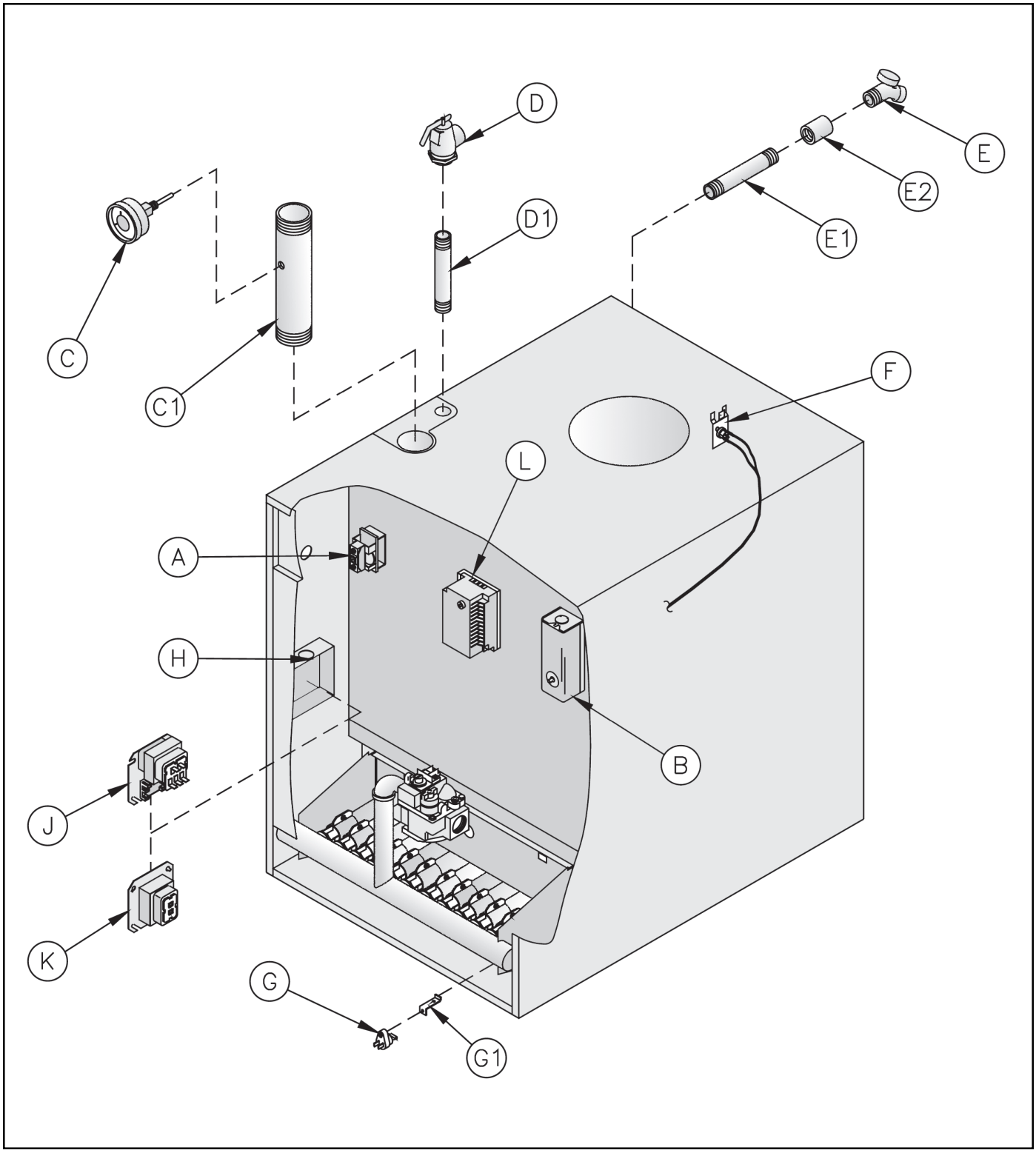
ITEM NO.	DESCRIPTION	PART NUMBER	SIZE	QUANTITY
5-14 Pilot Assembly and Piping -- Intermittent Ignition (EP-CSD-1) USA Only: 10 Section, Natural Gas Only				
A	Pilot Burner, Honeywell Q179C1009, Natural Gas	8236017	808 - 810B	1
B	Flame Rod Lead, Honeywell R1298020, 4 Ft. Lg.	71362561		1
C	Rajah Connector, Honeywell 37356	8236021		2
D	Ignition Lead, Honeywell R1061012, 3 Ft. Lg.	7136247		1
E	Ground Wire Assembly	6136259		1
F	Brass Compression Coupling, 1/4" OD Tube	8236008		1
G	ConBraCo Leak Test / Shut-Off Cock, 1/8" x 1/8"	822679		1
H	Brass Compression Adapter, ¼" OD Tube x 1/8"NPT	822630		2
J	Gas Solenoid Valve, Johnson H91WG-4	822662		1
K	Junction Box, 4" Sq. x 1½" Deep	8136259		1
L	Rigid Conduit Nipple, ½"NPT x 1½" Lg.	8136019		1
M	Conduit Locknut, ½"	8136220		2
N	Plastic Insulating Bushing, ½"	8136034		1
P	Regulator, Maxitrol RV12LT, Natural / LP Gas	8226005		1



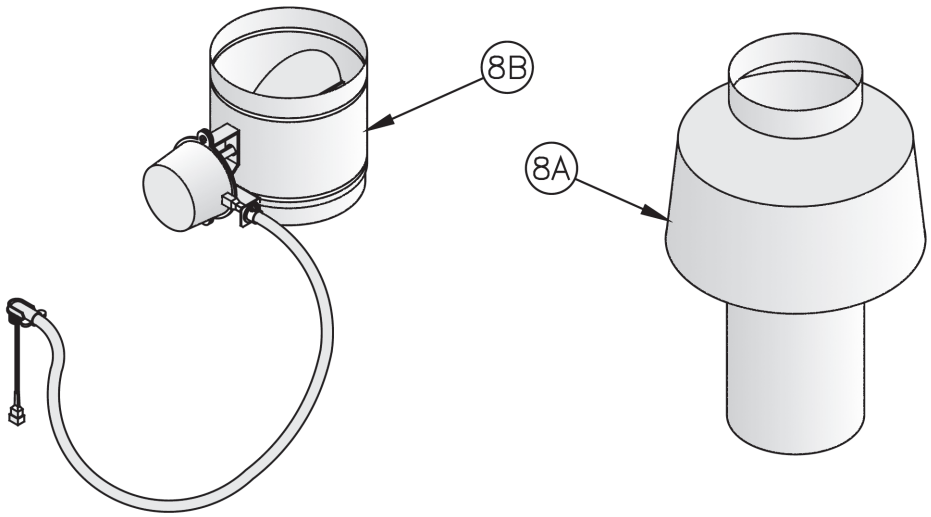

6B
6C
6G
6A
6H
6F
6D
6E
6J

Item No.	Description	Part No.	Quantity					
			805B	806B	807B	808B	809B	810B
6. Jacket								
6	Complete	60416051	1	---	---	---	---	---
		60416061	---	1	---	---	---	---
		60416071	---	---	1	---	---	---
		60416081	---	---	---	1	---	---
		60416091	---	---	---	---	1	---
		60416101	---	---	---	---	---	1
6A	Jacket Top Panel Assembly	70416053	1	---	---	---	---	---
		70416063	---	1	---	---	---	---
		70416073	---	---	1	---	---	---
		70416083	---	---	---	1	---	---
		70416093	---	---	---	---	1	---
		70416103	---	---	---	---	---	1
6B	Jacket Upper Rear Panel	60416055	1	---	---	---	---	---
		60416065	---	1	---	---	---	---
		60416075	---	---	1	---	---	---
		60416085	---	---	---	1	---	---
		60416095	---	---	---	---	1	---
		60416105	---	---	---	---	---	1
6C	Jacket Lower Rear Panel	60416056	1	---	---	---	---	---
		60416066	---	1	---	---	---	---
		60416076	---	---	1	---	---	---
		60416086	---	---	---	1	---	---
		60416096	---	---	---	---	1	---
		60416106	---	---	---	---	---	1
6D	Jacket Upper Front Panel	60416054	1	---	---	---	---	---
		60416064	---	1	---	---	---	---
		60416074	---	---	1	---	---	---
		60416084	---	---	---	1	---	---
		60416094	---	---	---	---	1	---
		60416104	---	---	---	---	---	1
6E	Jacket Front Removable Panel	7041605	1	---	---	---	---	---
		7041606	---	1	---	---	---	---
		7041607	---	---	1	---	---	---
		7041608	---	---	---	1	---	---
		7041609	---	---	---	---	1	---
		7041610	---	---	---	---	---	1

Item No.	Description	Part No.	Quantity					
			805B	806B	807B	808B	809B	810B
6. Jacket (Continued)								
6F	Jacket Left Side Panel	6041601	1	1	1	1	1	1
6G	Jacket Right Side Panel	6041602	1	1	1	1	1	1
6H	Jacket Vestibule Panel	60416053	1	----	----	----	----	----
		60416063	----	1	----	----	----	----
		60416073	----	----	1	----	----	----
		60416083	----	----	----	1	----	----
		60416093	----	----	----	----	1	----
		60416103	----	----	----	----	----	1
6J	Jacket Lower Front Tie Bar	70416052	1	----	----	----	----	----
		70416062	----	1	----	----	----	----
		70416072	----	----	1	----	----	----
		70416082	----	----	----	1	----	----
		70416092	----	----	----	----	1	----
		70416102	----	----	----	----	----	1


D
D1
E
E2
E1
C
C1
F
L
A
H
B
J
K
G
G1

Item No.	Description	Part No.	Quantity					
			805B	806B	807B	808B	809B	810B
7. Trim and Miscellaneous Controls								
A	Limit, 140-220°F, Honeywell L4080D1218 (EI & Standing Pilot); L4080B1212 ((EP & OP)	80160251 80160474	1	1	1	1	1	1
	Immersion Well, ¾"NPT x 1½" Insul. Depth	80160426	1	1	1	1	1	1
B	Limit, Manual Reset, Honeywell L4006E1133	80160703	1	1	1	1	1	1
B1	Immersion Well, ¾"NPT x 3" Insul. Depth	80160452	1	1	1	1	1	1
C	Temperature-Pressure Gauge	8056169U	1	1	1	1	1	1
C1	Nipple, 2 NPT x 10" w/Gauge Tapping	8061601	1	1	1	1	1	1
D	Safety Relief Valve, ¾ NPT, 50 psi	81660302	1	1	1	1	1	1
D1	Nipple, ¾ NPT x 3½"	806600038	1	1	1	1	1	1
E	Drain Valve, 3/4 NPT, ConBraCo 35-302-03	806603061	1	1	1	1	1	1
E1	Nipple, ¾ NPT x 3½"	806600038	1	1	1	1	1	1
E2	Coupling, ¾ NPT	806602561	1	1	1	1	1	1
F	Blocked Vent Switch Replacement Assembly	6016058	1	1	1	1	1	1
G	Flame Roll-out Switch	80160044	1	1	1	1	1	1
G1	Flame Roll-out Switch Mounting Bracket	7181612	1	1	1	1	1	1
H	Junction Box	8136010	1	1	1	1	1	1
J	Transformer/Relay, Honeywell R8285D500 (Intermittent Circulation builds)	80160155U	1	1	1	1	1	1
K	Transformer, 50VA (Continuous Circulation builds)	80160249	1	1	1	1	1	1
L	Ignition Module, Honeywell S8610M1003	80160116	1	1	1	1	1	1
	Alternate Ignition Module, Johnson G775RGA-1	80160184						
M	Vestibule Wiring Harness, Complete with Vent Damper Bypass Plug (EI and Standing Pilot) (Not Depicted)	81316010	1	1	1	---	---	---
		81316011	---	---	---	1	1	1



VENT DAMPER (OPTIONAL: 806–810; REQUIRED: 805B)

DRAFT HOOD

Item No.	Description	Part No.	Quantity					
			805B	806B	807B	808B	809B	810B
8. Draft Hood and Automatic Vent Damper								
8A	Draft Hood	8111605	1	---	---	---	---	---
		8111604	---	1*	---	---	---	---
		8111607	---	1**	---	---	---	---
		8111603	---	---	1*	---	---	---
		8111608	---	---	1**	---	---	---
		8111602	---	---	---	1*	---	---
		8111608	---	---	---	1**	---	---
		8111601	---	---	---	---	1*	1*
		8111609	---	---	---	---	1**	1**
8B	Automatic Vent Damper, 7"							
	Effikal RVGP-KS-7	8116146	1	---	---	---	---	---
	Automatic Vent Damper, 8"							
	Effikal RVGP-KS-8	8116147	---	1	---	---	---	---
	Automatic Vent Damper, 9"							
	Effikal RVGP-KS-9	8116148	---	---	1	1	---	---
	Automatic Vent Damper, 10"							
	Effikal RVGP-KS-10	8116149	---	---	---	---	1	1
All components for use in both U.S.A. and Canada, unless marked with * for U.S.A. Only or ** for Canada Only.								

BURNHAM CORPORATION

Ten Year Limited Warranty

COMMERCIAL CAST IRON BOILERS

SERIES 5B, 8B, V9, and V11

Burnham Corporation ("Burnham") hereby warrants to the original owner ("Owner") of each Series 5B, 8B, V9, and V11 commercial cast iron boiler (a "Boiler") manufactured by Burnham, as follows:

First Year - Limited Warranty: Burnham warrants that each Boiler will comply, at the time of manufacture, with recognized hydronics industry regulatory standards and requirements as then in effect and will be free from defects in material and workmanship under normal usage for a period of one year from the date of original installation. Subject to all of the terms and conditions set forth below, if any Boiler, cast iron section, or component part covered by this warranty is found not to conform with this warranty during the one year warranty period, Burnham will, at its option, repair or replace the non-conforming Boiler, cast iron section, or covered component part.

Second through 10th Year - Limited Warranty for Cast Iron Sections: Burnham warrants that the cast iron sections of each Boiler will be free from defects in material and workmanship under normal usage for a period of ten years from the date of original installation. Subject to all of the terms and conditions set forth below, if any cast iron section covered by this warranty is found not to conform with this warranty during the warranty period, Burnham will, at its option, repair or replace the non-conforming cast iron section.

The foregoing warranties are subject to the following terms and conditions:

1. **Applicability.** These warranties extend only to the original Owner at the original installation site and may not be assigned or otherwise transferred or extended to any other person or entity.

2. **Claim Procedure.** Owner must contact the original installer and provide the installer with a detailed description of the claimed defect. If the original installer is unable to resolve the matter to Owner's satisfaction, Owner must notify Burnham in writing at Burnham Corporation, P.O. 3079, Lancaster, PA 17604, which notice must be received by Burnham prior to the expiration of the applicable warranty period. Owner must make the Boiler available for inspection by Burnham and, if requested to do so by Burnham, must return the Boiler, cast iron section or defective component part to Burnham, at Owner's expense, for inspection and/or repair. Owner must cooperate with Burnham and take all commercially reasonable efforts to resolve and settle any dispute arising in connection with a warranty claim before resorting to legal remedies in court.

3. **Conditions.** The foregoing warranties are subject to the following conditions:

a.) **Installation Location.** The Boiler must be installed within the continental limits of the United States and Canada.

b.) **Proper Installation.** The Boiler must be installed by a qualified heating contractor (whose principal business is the sale, installation and maintenance of commercial boilers and related equipment) in strict accordance with the Installation and Operating Instructions Manual furnished with the Boiler and must not have been damaged prior to or during installation.

c.) **Annual Service.** The Boiler (including its related burner, controls, and other components and accessories) must be serviced annually by a qualified heating contractor (whose principal business is the sale, installation and maintenance of commercial boilers and related equipment) and proof of such service must be provided with each warranty claim. The required annual service must include all service and maintenance procedures specified in the Installation and Operating Instructions Manual furnished with the Boiler and all service and maintenance procedures specified in any instruction manual or similar document prepared by the manufacturer of the burner, controls and other components and accessories. Such annual service must also be performed in accordance with all applicable industry standards and procedures.

d.) **Proper Operation and Maintenance.** The Boiler must be operated and maintained in strict accordance with the Installation and Operating Instructions Manual furnished with the Boiler and all applicable industry standards and procedures.

e.) **No Alterations.** The Boiler must not have been modified, altered or changed in any manner.

f.) **Proper Application.** The Boiler must be used exclusively for purposes of commercial space heating or domestic hot water generation through a heat exchanger (or for a combination of such purposes).

4. **Exclusions.** The foregoing warranties do not cover claims arising from or relating to any of the following:

a.) **Component Parts and Accessories.** Claims relating to component parts and accessories manufactured by others are not covered by these warranties and will be subject only to the manufacturer's warranty, if any.

b.) **Improper Installation.** Claims arising from or relating to improper installation are not covered by these warranties.

c.) **Natural Disasters.** Claims arising from or relating to damage caused by natural disasters, including, but not limited to, lightening, fire, earthquake, hurricane, tornado, or floods are not covered by these warranties.

d.) **Alterations.** Claims arising from or relating to any alteration or other modification not authorized by Burnham in writing are not covered by these warranties.

e.) **Misuse.** The following claims are not covered by these warranties: claims arising from or relating to (i) misuse, abuse, mishandling, accident, neglect or improper service or operation of a Boiler, including, but not limited to, improper burner adjustment, control setting or maintenance and thermal shock from low water temperatures; (ii) operation of a Boiler over its rated capacity; (iii) operation of a Boiler with insufficient water, excessive fresh make-up water or inadequately deareated water; (iv) freezing of a Boiler or any part or component thereof; (v) operation with combustion air contaminated externally by chemical vapors or other contaminants, (vi) use of improper fuel additives; or (vii) operation of a Boiler with inadequately or improperly treated water that causes deposit build-up in the cast iron sections or other Boiler components.

f.) **Subsequently Installed Accessories.** Claims arising from or relating to Boiler accessories (including, but not limited to, circulators, air elimination devices, deaerators, flow controls and low water cutoffs) which are installed by Owner after delivery of the Boiler are not covered by these warranties.

5. **Exclusive Remedy.** If any Boiler, cast iron section or covered component part fails to conform to these warranties, Owner's exclusive remedy shall be to accept, at the option of Burnham, repair or replacement of the non-conforming Boiler, cast iron section or other component part. These warranties do not cover labor and other costs and expenses associated with the removal and replacement of a non-conforming Boiler, cast iron section or other component part, which costs and expenses shall be the sole responsibility of Owner.

6. **Limitation of Damages.** Under no circumstances shall Burnham be liable to Owner or to any other person for any indirect, incidental, special, consequential, or punitive damages of any kind whatsoever under these warranties or otherwise (including, without limitation, injury or damage to persons or property, loss of time or labor expense involved in repairing or replacing a non-conforming Boiler, loss of the use of the Boiler, and loss of profits, revenues or business, even if Burnham has been advised of the possibility of such damages), whether such damages are sought based upon breach of warranty, breach of contract, negligence, strict liability or any other legal theory. Burnham's liability under these warranties shall under no circumstances exceed the purchase price paid by the Owner for the Boiler involved.

7. **Exclusivity and Disclaimer.** These warranties are given in lieu of all other express warranties and set forth the entire obligation of Burnham with respect to any defective or otherwise non-conforming Boiler and Burnham shall have no obligations, responsibilities or liabilities of any kind whatsoever, except as set forth herein. EXCEPT AS SET FORTH IN THESE WARRANTIES, BURNHAM MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY, ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE AND ANY OTHER IMPLIED WARRANTY ARISING OUT OF A COURSE OF DEALING OR PERFORMANCE, CUSTOM, USAGE OF TRADE OR OTHERWISE.

8. **No Authority to Expand Warranty.** No sales representative, agent or distributor or has authority to expand or otherwise modify in any way the scope of these warranties or the obligations of Burnham hereunder. No such modification shall be binding unless set forth in a written document signed by a duly authorized officer of Burnham.

9. **Effective Date.** This statement of warranties is effective as to all Boilers sold on or after July 17, 2000 and supersedes all prior warranty statements.

Burnham

AMERICA'S BOILER COMPANY

Burnham Corporation

Lancaster, PA 17604

11/00